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Unintentional Injuries in Childhood

Results from Canadian Health Surveys

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Unintentional Injuries in Childhood: Results from Canadian Health Surveys

Barry Pless and Wayne Millar

The opinions expressed in this report are those of the authors and contributors and do not necessarily reflect the official views of Health Canada

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Published by authority of the Minister of Health

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Également disponible en français sous le titre
Blessures non intentionnelles chez les enfants – Résultats d'enquêtes canadiennes sur la santé

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Cat: H39-523/2000E
ISBN: 0-662-28607-3

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Acknowledgements

This report would not have been possible without the effort and cooperation of a number of individuals who participated in the preparation of this document.

The Health Canada project consultants, Sally Lockhart and Paula Hadden-Jokiel of the Childhood and Youth Division, were grateful for the tremendous hard work, dedication and patience of the authors Dr. Barry Pless from the Montreal Children's Hospital and Wayne Millar from Statistics Canada, and the tireless efforts of Rolande Ostiguy, Communications, Health Canada.

The authors are grateful to Barbara Willard, Bonnie Swaine, Judith Marshall, Diane Léger and Louise Martin for their assistance in the preparation of this report. Thanks are also due to the many colleagues who responded to a plea on the Epidemiology and Injury List servers to provide reports from other countries. In addition, the authors thank Lorie Root for her encouragement and patience, Health Canada for supporting this work, and finally Yvonne Robitaille and Susan Mackenzie for reviewing drafts and making constructive suggestions.

Preamble

Over the past three decades there has been a growth in concern about childhood injuries in Canada, as injuries are the leading cause of death in children and youth in Canada. Groups like the Canadian Institute of Child Health and more recently, Safe Kids Canada, prompted much of this increased attention by using data from government surveys. Although such data are rarely as complete as many users would like, they are, nonetheless, useful. At the very least they provide estimates of the magnitude of the problem among different sectors of the population. Unfortunately, it is often not easy to obtain or use these data. This report is intended to help the user by presenting the results of various surveys in a form and at a level of detail that we assume will be more helpful than what is normally available.

Worldwide, health surveys have become increasingly popular and important. Data obtained from the population by this means are used for decision making by governments and other organizations. The growth in popularity reflects the technical advances that have been made in the science of sample surveys, as well as the greater reliance placed on survey data in planning health services and programs.

The principal goal of this report is to describe what has been learned about childhood injuries from recent Canadian health surveys. Four national population-based surveys have been analysed to this end – the General Social Survey (GSS), the National Population Health Survey (NPHS), the National Longitudinal Survey of Children and Youth (NLSCY), and the Health Promotion Survey (HPS). Information from these studies is analysed to permit a description of the characteristics of the children who are injured and the circumstances of their injuries. A secondary goal is to obtain some further details about possible risk factors. The ultimate objective, of course, is for these data to help inform policies and programs aimed at prevention. Finally, we hope that these analyses will underscore some of the shortcomings in how these surveys deal with the problem of injuries so that these limitations can be overcome in the future.

Organization of Report

This report begins with a description of the four data sources referred to above. In the Introduction, we provide a partial review of important health surveys conducted in other countries and in some Canadian provinces. Some of these are referred to again in the concluding section. It should be clear that there are many such surveys we have failed to identify because of limitations in time and resources. This is of little concern, however, because our goal in this review was not to be comprehensive. Rather, it was to help situate what is done in Canada in a broader context.

As will be more fully explained, a major limitation of this review is that we have the impression that there are many national surveys that either fail to obtain any information about children or, if they do, fail to include information about injuries. It must also be appreciated that many surveys are not primarily oriented toward health. Nevertheless, as in the case of the GSS in Canada, even many such omnibus surveys often include some health questions. The most egregious omissions are those that fail to include children. Equally puzzling are those that include child health but ignore injuries.

The section that follows begins by providing some detailed definitions; a general description of the four Canadian surveys, including a description of the methods by which they obtained their data; the statistical assumptions and procedures used in the analyses; and some salient methodological limitations.

The meat of the report is included in the section headed "Results." It presents descriptive demographics of childhood injury in each of the surveys under consideration. In each instance, when the data permit, injury occurrence is presented by age, sex, socio-economic status measures, and geographic characteristics.

In some parts of this section, other correlates of injury in these data sets are presented. These highlight, to the very limited extent that is possible, models of potential injury predictors. It must be noted that an inherent limitation of most surveys [with two outstanding exceptions, the NLSCY and the NPHS], is their cross-sectional nature. This precludes any substantive modelling of true predictors.

In the Discussion, we attempt to draw from the preceding analyses implications for research and for injury prevention, including health policy initiatives. In this, the important distinction between initiatives that lie within provincial versus federal jurisdictions are examined. Recommendations are made for future surveys that will provide still more useful information on childhood injury.

Introduction

Injuries are the major cause of death in childhood. That much is known and widely acknowledged. Data from vital statistics that are maintained by most countries have established this sobering fact. Similarly, although hospital discharge statistics provide a measure of the substantial morbidity arising from injuries in childhood, hospital data rarely permit a search for risk factors. It is, therefore, to a variety of health surveys that we turn to learn more about the precursors of these tragic events. We acknowledge that surveys, as such, even longitudinal studies, are a poor substitute for well-designed, purpose-built research focussing on specific causal hypotheses. But we believe survey data are valuable and generally under-utilized. In part, as has been stated, they are often presented in a manner that makes it difficult for casual or even more expert users to take full advantage of them. This is one reason for this report.

Regrettably, many health surveys ignore children completely or relegate them to a secondary status. Equally regrettable is that even when a survey samples children appropriately and does an otherwise good job in assembling details about their health, it often fails to include injuries among the array of health problems, or does so only in a cursory manner.

The four Canadian surveys whose data are examined in this report illustrate both the advantages and disadvantages in using this method of data collection to better understand the forces behind childhood injuries and thus enhance their prevention.

Definitions

Although at first glance it may seem obvious that everyone understands what a survey is, after consideration the definition of a survey is often not quite so transparent. Therefore, for the purposes of this report we have, somewhat arbitrarily, defined health surveys as the systematic collection of health or health-related information from a clearly defined sample of the population. Implicit in the latter phrase is the critically important element that the data collection is population-based (i.e. that the denominator is known). It is in this sense that other, seemingly similar, forms of data collection are best distinguished: surveillance systems, for example, may collect similar information, but rarely, if at all, in a population-based manner. This is also typical of most hospital data collection systems. Only in some rare instances (e.g. where the hospital is isolated and serves a reasonably fixed and defined population), may it be argued that the data from these systems are equivalent to surveys (i.e. population-based).

Also, in a perhaps arbitrary manner, we have excluded from our review surveys of other countries (or provinces) which are confined to small communities – and by small, we have set a cut-off at 100,000 persons. In other words, unless the survey is conducted on populations larger than this number, we have chosen to ignore it. In part, this decision is driven by our interest in children (and with a smaller population base the numbers of children would be insufficient) and our realization that few surveys focus exclusively on children. Instead, the more typical situation is that a sample of households is drawn and if children are present in the family of the respondent, proxy information may or may not be obtained about them. Surveys that have been planned or completed prior to 1985, and those that are topic-specific are not included (e.g. dental health).

Surveillance systems are often confused with surveys, as are registers. Typically, neither conforms to the definition laid down above because they are not population-based. Conversely, however, if a survey is repeated at regular, reasonably closely spaced intervals, it may serve some of the purposes of a surveillance system. An outstanding example of this is the National Health Interview Survey in the United States. In spite of this positive quality, it nevertheless falls short, however, because one of the objectives of a good surveillance system is that the results are available in a sufficiently short time period to permit a sharp or sudden increase in events of interest.

Registers exist for many diseases and there are now a number of "trauma registries." These are usually oriented toward the assembling of data about serious injuries – those requiring hospitalization at least. Almost invariably they are, of course, hospital-based and thus suffer from the same shortcoming as most surveillance systems – the absence of an identifiable denominator.

It should be noted that although nowadays the term "injury" is preferred to accidents, the latter word is still in common usage. Moreover, the use of the term "accidents" varies depending on the survey involved. Although in common parlance the term is most often associated with physical trauma, in most surveys it includes poisoning.

Methods

Most surveys, especially those conducted at a national level, collect data from households. Most often they do so using a sampling procedure that proceeds in several stages (e.g. from census tract to household). Consequently, they obtain data in "clusters," and extrapolating back to the population at large is complex. Invariably, regardless of the extent of clustering, weighting is required to reconstitute the figures that would actually exist in the population on which the survey is based. In this report, the weighted figures are used, with some form of designation of the actual magnitude of the numbers involved.

Although telephone surveys have become increasingly popular in recent years, and often include such techniques as random digit dialing, most seek more information than can be obtained in the time available for a telephone conversation. Fortunately, two of the four surveys analysed for this report involve face-to-face interviews with a member of the household. Thus, in these two surveys information about children (with the exception of older adolescents) is obtained from a parent or other proxy respondent.

Data Sources

Data relating to the pediatric population (ages 0 to 19) are obtained from a series of health surveys conducted by Statistics Canada. For the population age 15 to 19, data are more readily available because the majority of health surveys include this age group. When surveys ask about the prevalence of injuries in the population below age 15, they may not ask the same questions as posed to the 15 to 19 age group, or the ages covered by the survey may not encompass the entire pediatric age range. Consequently, it is usually not possible to provide trend data on various dimensions of injury over all of the age groups that constitute the pediatric population.

This section presents an overview of four major databases from which injury statistics in this report are obtained. For each survey, we present information relating to sample design, sample size and the content of the questions relating to injury. Because the sampling methods are similar in the various surveys, the approach to the presentation of estimates is consistent in all the reports. The sources for the estimates in this report are the 1990 Health Promotion Survey, the 1993 GSS, the 1994-95 NPHS, (the supplemental questions on the NPHS), and the NLSCY 1994-95. Considerations relating to data analysis will be addressed at the end of the discussion relating to the data sources.

General Social Survey

Since 1985, Statistics Canada has conducted the **General Social Survey (GSS)** to monitor changes in Canadian society and to provide information on current or emerging policy issues. The GSS operates on a five-year cycle, each year focussing on one of five core subjects. Personal risk, which included the incidence and consequences of "accidents,"[1] was the focus in 1988 and again in 1993. (The GSS has since dropped injury from the personal risk cycle. This issue is being addressed by the NPHS and the NLSCY.) The main body of the survey was directed at the population aged 15 and over. In addition, the survey asked a series of questions relating to children in the household.

[1]Terminology used in the survey

For the primary target population, "accident" screening questions obtained information relating to the type of "accident." Four types were identified: motor vehicle, sports, work, and home. These categories are not mutually exclusive. To eliminate double counting, the methodology established a hierarchy: motor vehicle, work, sports, and home "accidents" were assigned in that order. For example, a motor vehicle accident (MVA) that happened at work was classified as a motor vehicle accident. The effect of this was to increase the reported incidence of MVAs, while reducing the incidence of other types. Events that did not fall into one of the four categories, or for which information was insufficient to make a classification, were relegated to a residual "unclassified" group. Medical consequences of these injuries were assessed through a series of questions about whether respondents received medical attention or experienced activity loss/disability days as a result of the injury. Activity loss days included bed-disability days, which in turn, included hospital days.

GSS questions also probed the economic consequences of injuries ("accidents"). Personal expenses were measured with questions about financial losses or extra expenses incurred as a result of the injury. Respondents were also asked if they had recovered any of these costs from an automobile insurance policy or Worker's Compensation. In addition, they were asked to give their best estimate of out-of-pocket expenses (e.g. the deductible on auto insurance claims, legal expenses, non-insured dental care, extra transportation expenses, prescription drug costs, or chiropractic or physiotherapy services).

Questions focussed on children under 15 years of age obtained data relating to injuries in the past 12 months, medical attention for injuries, the number of incidents requiring medical attention, where the child received medical care, the time of day the injury occurred, activity at the time of the injury, nature of the injury, parts of the body injured, and overnight hospital stay.

The 1993 GSS survey is based on a sample of 10,385 households. The response rate was 82%, if it is assumed that households for which there was no response were "in scope" (i.e. had at least one eligible member). The population was sampled by random digit dialing. Sample weights (person weights) were adjusted for non-response and for differences between the target population and the surveyed population. Injury weights are assigned weights equivalent to the person weight. The total number of injuries was calculated by multiplying the number of injuries reported by each person, by the incident weight, then summing these figures. Further information relating to the 1993 GSS may be found in published reports. (1,2)

National Population Health Survey

The **National Population Health Survey (NPHS)** was designed to measure the health status of Canadians and, in doing so, to expand the knowledge of the determinants of health. Questions relating to injuries in the NPHS survey were answered by respondents age 12 and over. Items focussed on injuries were restricted to those injuries serious enough to limit the respondent's normal activities. Data were obtained on the number of injuries in the past year, the type of injury, part of the body injured, where the injury occurred, the cause of the injury, whether the injury was work related and the precautions the respondent is taking to prevent injury from happening again. Although a child could have experienced more than one injury in the past year, respondents were asked to report only on the most serious injury. Consequently, the questions relating to type of injury, part of body injured, location of injury and nature of injury refer to the most serious injury.

Of the 17,626 randomly selected respondents aged 12 and older, 14,786 were eligible members of the NPHS longitudinal panel. These respondents were also eligible for the Health Canada supplement. The Health Canada set of supplemental questions obtained data about where people got information about health and health services. It also included questions about parents' awareness of the relative importance of various diseases as a cause of death in young children. Finally, it asked about sources of information relating to car safety seats, traffic safety, prevention of injury in the home, treatment of a child choking in home, swimming safety, bicycle safety and prevention of sports injuries. The supplemental questions also expanded the information relating to bicycling (and tricycling) and helmet use, and the reasons associated with the use of helmets or seat belts.

The response rate to the Health Canada – sponsored questions was 90.6%. (The database containing information from the Health Canada supplement as well as data from the General and Health files pertaining to these respondents is called the Supplementary file.) The sample size pertaining to youth aged 12 to 19 in the NPHS supplementary file was 1,373 (678 males and 695 females).

The component of NPHS that is longitudinal will collect information from the same panel of respondents every two years for up to two decades. The target population of the NPHS consists of household residents in all provinces and territories, except persons living on First Nations reserves, on Canadian Forces bases or in some remote areas. An institutional component covers long-term residents of hospitals and residential care facilities.

NPHS includes a sample of 20,000 households. The base sample sizes in each province were determined by using an allocation that balances the reliability requirements at national and regional levels. Some provinces chose to increase the sample size to increase the utility of the survey. This resulted in a final sample size of 26,430 households. The response rate was approximately 88% of households. Further information relating to the sample design and methodology of the NPHS may be found in published documents. (3-5) The final sample size of the NPHS supplemental survey was 13,378.

National Longitudinal Survey of Children and Youth

The objective of the **National Longitudinal Survey of Children and Youth (NLSCY)** is to develop information for policy analysis and program development on critical factors affecting the development of children in Canada. More specifically, the objectives are to determine the prevalence of various biological, social and economic characteristics and risk factors of Canadian children and youth. In addition, the study aims to monitor the impact of such factors, life events and protective factors on the development of children and to provide information to policy and program officials for use in developing effective policies and programs.

Questions relating to injury are similar to those asked in the NPHS. Data were obtained on the incidence of injury, type of injury, part of body injured, location of injury and the cause of the injury. The importance of information relating to injury in the NLSCY is increased because of the extensive amount of background information relating to the home, community and school environment of the child. Information was also obtained on child development, sleep disorder, prescription drug use, use of alcohol, drugs and cigarettes, and exposure to domestic violence. All of these data are important for defining the social and physical environment in which a child lives and are important in understanding the etiology of injury.

Since the purpose of the NLSCY is to follow a representative sample of children from birth to 11 years into adulthood, the target population for the first data collection in 1994-95 consisted of Canadian children from birth to 11 years of age. Approximately 25,000 children were included in the first survey. The sampling frame of the Labour Force Survey was used to design the sample. Although the Labour Force sampling frame excludes persons living in the Yukon and the Northwest Territories, the sample includes approximately 2,300 respondents in the territories.

All children under 11 years residing in selected households who are members of the same economic family are included. For analyses, they are divided into seven age groups: 0-11 months, 1, 2-3, 4-5, 6-7, 8-9 and 10-11 years. These groupings permit analysis every two years while maintaining an overemphasis in the youngest groups by retaining 1-11 months and one-year-olds as separate groups. (6,7)

One component of the NLSCY is integrated with the NPHS. Because both the NLSCY and the NPHS needed to collect data on the health of Canadian children, it was decided that a portion of the sample and content of the two surveys would be integrated at the provincial level. Thus, children selected by the NPHS were to be part of the sample for both surveys. For the integrated portion of the surveys, the intention is that all of the NLSCY survey instruments will be used to collect information regarding the children in the sample. The NPHS instruments are used for persons in the sample who are 12 years of age and over. To ensure comparability, concepts common to both surveys were achieved through a standard set of questions.

Health Promotion Survey

The 1990 **Health Promotion Survey (HPS)** was conducted to update and expand national and provincial baseline data on the knowledge, attitudes, beliefs, intentions and behaviour of adult Canadians on a wide range of health promotion issues. Among the topics included were workplace health, environmental health and safety. Questions relating to injury prevention included items on seat belt use, helmet use, use of all-terrain vehicles or snowmobiles in the past 12 months, beliefs and attitudes regarding government involvement in injury prevention, use of an automobile within two hours of drinking, presence of first aid kits, fire extinguishers and smoke alarms in the home. Although the sample is restricted to age 15 and over, it is possible to define households in which children aged 5 or less, 6-11 and 12-14 years are present. This information can be used to classify households by presence of children and household characteristics.

The 1990 HPS used a random digit dialing survey method. The target population was all persons 15 years of age and older living in Canada with the following two exceptions:

1. residents of the Yukon and the Northwest Territories; and
2. full-time residents of institutions.

In order to carry out the sampling, each of the 10 provinces was divided into strata or geographic areas. Generally, for each province one stratum represented the census metropolitan areas (CMAs) and the other the non-CMA areas. The sample was created through the use of two different methods for generating telephone numbers: the Waksberg method and the elimination of non-working banks method (ENWB). The final sample of the 1990 HPS was 13,792 respondents. More detail relating to the sample design, weighting procedures and limitations of the 1990 HPS may be found in published reports. (8,9)

Analytic Procedures and Principles

None of the surveys listed above is a simple random survey. Instead, the surveys have complex designs, with stratification and multiple stages of selection, and unequal probabilities of selection of respondents. Using data from such surveys present problems to analysts because the survey design and the selection probabilities affect the estimation and variance calculation procedures. Where surveys use a stratified design with significant differences in sampling fractions between strata, some areas may be over-represented in their sample (relative to the population) while other areas may be under-represented.

Most of the above surveys used stratified design with significant differences between sampling fractions. This means that the unweighted sample is not representative of the target population. The survey weights must be used when producing estimates or performing analyses to account for over- or under-representation. While many analytic procedures found in statistical packages allow weights to be used, the meaning or definition of the weight in these procedures often differs from that which is appropriate in a sample survey framework. The result of this is that while in many cases the estimates produced by the packages are correct, the variances that are calculated may be almost meaningless.

Because of the large variety of estimates that can be produced from a survey, the standard deviation is usually expressed relative to the estimate to which it pertains. The resulting measure, known as the coefficient of variation of an estimate, is obtained by dividing the standard error of the estimate by the estimate itself and is expressed as a percentage of the estimate. Screening of survey estimates is done with the approximate sampling variability tables provided in the documentation for each survey. The goal is to ensure that there are sufficient numbers to result in acceptable variation coefficients.

In the surveys that involve a cross-sectional design, caution is required in making causal inferences about the association between variables. Observed associations may reflect differences between cohorts, period effects, differences between age groups, or a combination of these factors.

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Survey Overview

Although an attempt was made to identify the pertinent surveys in other countries (and provinces in Canada), there was neither enough time nor resources to permit us to do so comprehensively. Accordingly, this section provides a sample of the more prominent examples of population-based health surveys to help situate what has been done in Canada in a broader context.

In 1997, *Chronic Diseases in Canada* published a comprehensive review of Canadian Health Surveys by Kendall, Lipskie and MacEachern. It provides a history of such surveys and shows the shift in focus from basic outcomes to a wide range of determinants, especially since 1974, the date of the Lalonde report. As they note, the types of surveys range from occasional cross-sectional surveys, to periodic surveys, longitudinal surveys, those that are school-based and those based on other subgroups or specific topics.

Kendall et al. (1997) note in their introduction that surveys have a long history, dating back to biblical censuses. They emerged in the 1800s as opinion polls used for political and market research. The origin of the term "survey" is the Latin sur [over] and videre [see], thus, "oversee."

As the Kendall paper reminds us, although the focus of the present report is on national surveys, there are several well-done provincial surveys that provide valuable and, often, complementary data. In addition, there are commercial surveys. Notably, few of either of the last two categories, provincial or commercial, address child injuries in any significant manner.

Among the provincial surveys that have done so are the following: the Ontario Child Health Survey (1983 and 1987), Enquête Santé Québec (1987), Ontario Health Survey (1990), and the BC Adolescent Health Survey (1992). It is indicative of the perceptions of the relative importance of various health problems, that of the 10 provincial surveys that involved children, all had an exclusive focus on drug use. Yet, using either mortality or hospitalization data as indicators of the relative importance of injuries versus drugs among children, the evidence suggests that this emphasis on drugs is misplaced. At the very least, equal attention should be given to injuries, not only because of the numbers but because of the great potential for prevention.

In Canada, the first survey devoted exclusively to health was the Canada Sickness Survey which took place in 1950 and involved a sample of 36,389 respondents representing all age groups. Between that date and the 1970s when the Nutrition Canada and Canada Health Surveys took place, there was a series of Labour Force Surveys on Smoking Habits. The 1978 Canada Health Survey, which included a lifestyle component for those over 15 years, asked questions about the prevalence of injuries serious enough to limit normal activities (e.g. location, time, health consequences, MVA involvement).

The 1983 Canadian Health and Disability Survey examined causes of disability and included a sample of more than 59,000 children. Similarly, the Canada Health Attitudes and Behaviours Survey the following year involved a sample of 33,111 children in Grades 4, 7 and 10 and included questions related to safety. The Health and Activity Limitation Survey of 1986 focussed on disabilities in all age groups, including, perhaps, their causes. Campbell's Survey on Well-Being occurred twice, the second being a follow-up of the 1981 Canada Fitness Survey.

In the 1980s, there was the Canada Fitness Survey and the Canada Health Knowledge survey – the latter involving children in Grades 4, 7 and 10. This included several questions on risk behaviours and safety and involved a sample of 28,905 children in each of the provinces. However, although the 1980s saw a sharp increase in the number surveys (19 in all), only a few included children. And, even among these injuries were rarely covered.

The same pattern continued into the 1990s. Only 6 involved children. In the case of some, e.g. NPHS, the involvement of children was minimal in that it only included those children aged 12 to 19 years. As the authors of two large surveys of youth, the Canadian Health Knowledge Survey and the Canada Health Attitudes and Behaviours Survey, sponsored by Health and Welfare in the 1980s, state, these "led to Canada being invited to join a WHO collaborative study on health behaviours of school-aged children conducted approximately every four years." This collaborative endeavour, involving 32 countries, now represents yet another opportunity to obtain valuable comparative data on injury occurrence.

To summarize, in *Canada*, several provinces have conducted one or more health surveys. Of greatest value and interest are those that have been repeated at least once. This permits a comparison of changes over time, assuming, of course, that the basic methods remain the same, including, in particular, the form and structure of questions. An example is Santé Québec (Quebec Health Survey), conducted first in 1987 and again in 1992. Although the questions addressing injuries were not precisely identical (as a result of an effort to improve them), a number of useful and illuminating comparisons are available. Finally, the Ontario Health Survey is another such example. Regrettably, the Ontario Child Health Survey, which included a follow-up after the original study in 1983, did not include questions about injury.

Since 1957, the *United States* has conducted a Health Interview Survey annually. Periodically, this is supplemented by a survey with questions dealing specifically with the health of children. Both in the main survey, and the supplements, questions about injuries have been asked. In addition, the United States conducted a Health Examination Survey which, in 1971, was expanded to include a nutritional component (the NHANES). The National Ambulatory Medical Care survey may also qualify as a population-based survey because it involves an attempt to obtain data about medical visits to a sample of physicians, as does the hospital discharge survey. Two special reports dealt exclusively with injuries, including those affecting children.

In *Britain*, an exceptional situation exists. Beginning in 1946, a sample involving all children born during one week in March was assembled and followed periodically as a cohort. Subsequently, similar surveys, each involving cohorts of births during the same time period, were conducted in 1958 and 1970. The positive aspect of these studies is the repetition of the survey at follow-up intervals varying between several years (in the case of the 1956 cohort) to longer intervals in the subsequent birth cohorts. Unfortunately, in each instance, questions about injuries were somewhat superficial and not always asked in a consistent manner, thus making comparisons difficult. On the other hand, it is to the great credit of the survey organizers that they saw fit to include injuries when many today still fail to do so.

Australia has conducted two important surveys that include data on childhood injury: the National Health Survey (NHS) and the Western Australia Health Survey. The latter is an "one-off" survey that included children aged only 4 to 16 years, whereas the former is repeated at regular intervals. The NHS has a filter following a general question about health conditions that prompted certain defined actions. This leads to questions about whether they were due to an "accident" (work-related or not); the type of injury (fractures, dislocations, etc.), the mechanism (MVA, fall, etc.), and the location. The most recent "accident" is coded based on age, so that somewhat different questions about the setting apply to those 5 to 14 years and those 15+ years.

The tables below summarize much of what is now known about health surveys in Canada and several other countries. As stated before, this information is neither comprehensive nor is it necessarily up-to-date. It does, however, provide a reasonable overview of where matters stand in the late 1990s.

Table SO1 — Canadian Surveys

Survey	Country	Responsible Organization	Scale	Type	Injury Data[1]	Ages	Dates
Aboriginal People's Survey	Canada	Statistics Canada	National Aboriginal Population	Face-to-face			1991 – 92 1996
Campbell's Survey on Well-Being	Canada	Canadian Fitness and Lifestyle Research Institute	National	Self-Administered Questionnaire	0	7 +	1981 – 88
Canada Health Attitude and Behavior Survey	Canada	Social Program Evaluating Group, Queen's University	National	Self-Administered Questionnaire in classroom	0	Grades 4,7,10	1984-5
Community Risk Factors Survey	Canada	Laboratory Centre for Disease Control, Health Canada + 10 Community Health Units	National	Phone survey	0	15 +	1985-1988
General Social Survey (GSS)	Canada	Statistics Canada	National	Phone survey (RDD)	2	15 +	4 cycles Cycle 1–1985 Health and Social Support Cycle 3 – 1988 Accidents and Personal Risk Cycle 6 –1991 Cycle 8 –1993 Risk & Injury
Health and Activities Limitation Survey (HALS)	Canada	Statistics Canada	National	Household interview	0	ALL	1986-7 1991-2
Health Promotion Survey (HPS)	Canada	Statistics Canada Health Canada	National	Phone survey (RDD) Home (north)	0	15 +	1985 1990
National Alcohol and Other Drugs Survey (NADS)	Canada	Statistics Canada Health Canada	National			15 +	1989
National Longitudinal Survey of Children and Youth (NLSCY)	Canada	Statistics Canada Human Resources Development Canada (HRDC)	National	<10 – face-to-face 10 – 11 – Self-Administered Questionnaire	2	0 – 11	1994 1996 Bi-annual

Table SO1 — Canadian Surveys *(cont'd)*

Survey	Country	Responsible Organization	Scale	Type	Injury Data[1]	Ages	Dates
National Population Health Survey (NPHS)	Canada	Statistics Canada	National household interview		2	All	1994 – Longitudinal
National Survey on Drinking and Driving (NSDD)	Canada	Statistics Canada Health Canada	National			16-69	1988 1992
Ontario Child Health Study	Canada	Statistics Canada McMaster University	Provincial	Household interview	0	4-16	1983 1987 Longitudinal
Ontario Health Survey	Canada	Ontario Ministry of Health and the Premier's Council on Health Strategy	Provincial	Self-Administered Questionnaire + face-to-face	0	12 +	1990 every 5 years
Quebec Health Survey (QHS)	Canada	Quebec Ministry of Health and Social Services + 32 community health departments	Provincial	Interviewer questionnaire	2	ALL	1987 1992 – 3
The Canada Health Monitor	Canada	Price Waterhouse Syndicated – multi-scriber	National	Phone survey	1	15+	1988 – semi-annual
WHO Cross-National Survey Behaviours of School-Aged children	Canada and others	WHO	International	Teacher-administered questionnaire	1 2	11,13, 15	1982 (not WHO) 1983-84 1985-86 1989-90 1993-4 Every four years

Injury data: 0 = none 1 = minimal 2 = adequate

Table SO2 — United States Surveys

Survey	Country	Responsible Organization	Scale	Type	Injury Data[1]	Ages	Dates
Annual Survey of Occupational Injuries and Illnesses	United States	Bureau of Labor Statistics, Department of Labor, U.S. government	National	Mailed questionnaire copy of Log Summary of Occupational Injuries and Illnesses	2	No minimum age	1971 – Annual
National Ambulatory Medical Care Survey (NAMCS)	United States	NCHS, CDC, PHS, DHHS. U.S. government	National	Office-based physicians	1	ALL	1973 –
National Health and Nutrition Examination Survey (NHANES)	United States	NCHS, CDC PHS, DHHS. U.S. government	National	Household interview	0	Cycle 1: 1-74 yrs Cycle 2: 6-74 yrs Cycle 3: 6 mths	NHANESI: 1971-4 NHANES II: 1976-0 Hispanic HANES: 1982-84 NHANESI Follow-up NHANES III: 1988-94
National Health Interview Survey (NHIS)	United States	NCHS, CDC, PHS, DHHS. U.S. government	National	Household interview	2	ALL	1957 – Annual
National Hospital Ambulatory Medical Care Survey	United States	NCHS, CDC, PHS, DHHS	National	OPD records	2	ALL	1991 –
National Hospital Discharge Survey	United States	NCHS, CDC, PHS, DHHS	National	Discharge records	N/A		1965 –
National Household Surveys on Drug Abuse	United States	NIDAA	National	Household interview	N/A	12 yrs+	1971 – The 1991 survey is the 11th in this series which began in 1971

Injury data: 0 = none 1 = minimal 2 = adequate

Table SO3 — Other National Surveys

Survey	Country	Responsible Organization	Scale	Type	Injury Data[1]	Ages	Dates
National Survey of Health & Development (1946 Birth Cohort)	Great Britain	Medical Research Council & others	National	Questionnaire interview and examination	1 – 2	0 – 4,7,11	1946 – Continuing longitudinal
National Child Development Study (1958 Birth Cohort)	Great Britain	Medical Research Council & others	National	Questionnaire interview and examination	1 – 2	0 – 4,7,11	1958 – Continuing longitudinal.
Child Health and Education Study (1970 Birth Cohort)	Great Britain	University of Bristol, National Birthday Trust	National	Questionnaire interview and examination	1	Birth +	1970 – Continuing, longitudinal
General Household Survey	Great Britain	Office of Population Censuses and Surveys	National	Questionnaire telephone	Topics vary	ALL	1971 Annual
Continuous Health Survey	Northern Ireland	National					1983 –
Safety in the Home	Australia	Australian Bureau of Statistics	Community of Melbourne	Sup. Australia monthly population survey / questionnaire	1	0-4, 5-14, 15+	1992
National Health Survey	Australia	Australian Bureau of Statistics	National		1	5-14, 15+	
Western Australia Health Survey	Australia	Australian Bureau of Statistics	National		1	4-16	
Dunedin Multi-disciplinary Health and Development Study	New Zealand	Medical Research Council of New Zealand	Community	Questionnaire interview, exam	1 – 2	Birth +	1972 – 3 Continuing longitudinal
Kuwait Child Health Survey	Kuwait	Gulf Health Survey Programme (GHSP)	National	Questionnaires examination	0	< 6	1987
National Child Health Survey	United Arab Emirates, etc.	GHSP	National	Questionnaires examination	0	< 6	1987-1989
Nordic Questionnaire	Scandi-navian	?	National	Postal questionnaires	?	2 – 18	?
"Patient Survey"	Japan	Ministry of Health and Welfare	National	In/Out hospital data	1	ALL	Every 5 years since ?
Enquête sur la Santé et la Protection Sociale	France	Centre de Recherche d'Étude et de Documentation en Économie de la Santé (CREDES)	National	Telephone household survey	1	<16, 16 +	1988 – Annual
National Health Survey	Germany	Ministry of Health and Welfare?	National	Questionnaire examination	1	ALL	Annual since 1963
National Health Interview Survey	Nether-lands	Central Bureau of Statistics	National	N/A	N/A	N/A	Since 1977?

Injury data: 0 = none 1 = minimal 2 = adequate

Results

General Social Survey – Personal Risk

Canada's General Social Survey (GSS) began in 1985 and has been repeated at five-year intervals since then. Its goal is "to monitor changes in Canadian society and to provide information on current or emerging policy issues." Each five-year cycle focusses on one of five core subjects. One of these is "personal risk" which includes the incidence and consequences of "accidents." This was the focus of the 1983 and 1993 surveys and the data reported here are derived only from the most recent, 1993, data.

The target population of the GSS is persons aged 15 and over in all provinces but excluding residents of the Yukon and Northwest Territories and full-time residents of institutions. Thus, although only those over 15 were interviewed, they were asked to report on "accidents" involving those under age 14 years. A series of screening questions was asked to determine if an "accident report" was required. Only events meeting the follow criteria and occurring in the previous 12 months from the date of the interview were counted. One or more of:

- interruption of normal activities for at least half a day;
- causing out-of-pocket expenses of at least $200; or
- requiring medical attention from a physician or nurse.

Only four types of "accidents" were identified: motor vehicle, sports, work, and home. Because these are not mutually exclusive, a hierarchical procedure was followed in the sequence stated so that, for example, a motor vehicle injury arising when the victim was at work, would be classified only as "motor vehicle." As stated earlier, "accidents" included poisoning and this will not, therefore, be repeated on each of the tables that follow.

Readers are reminded that the percentages presented in the tables are based on weighted estimates and that these represent the numbers likely to be found in the general population. Also, note sums may not total due to rounding. Another important reminder is that for the GSS as for the other surveys reviewed, invariably some responses to any question are "don't know" or the response is not coded for one reason or another. The proportion of such unusable responses, although low (in the range of 2% to 3%), varies from question to question. The convention of calculating percents over all categories was followed in this report. In most of the following tables, the responses for each variable specified are based on just under 3,000 children. (This represents, when weighted, a population of just over 6 million children under age 15 years.)

Occurrence

In the sample of 2,946 children, 304 under 15 years had been seen by a doctor for an injury or poisoning in the last 12 months. When weighted to reflect the number in the general population, this is equivalent to 559,000 injured children or 10% of all children in this age group. Approximately 102,000 children had more than one injury in the past year, which is about 2% of all children.

Table 1 – Number and percent of children aged 0-14 years injured in the past year, by age group, Canada, 1993

Characteristic	Population (000s)	Number of injured (000s)	% of Injured
Age group			
0-4	2,000	170	9
5-9	1,891	194	10
10-14	1,883	196	10
Total	5,773	559	10

Source: General Social Survey, 1993

Distribution

More than two thirds of the injured children, 69%, were from urban areas, similar to the proportion of Canadians actually living in urban communities. In general, the percent distribution of injured youth reflects their distribution in the population. Some differences exist, however. For example, boys represent about 51% of the population of youth, but 58% of the injured. Although children aged 0 to 4 comprise 35% of the population aged 0 to 14, they represented only 30% of the injured population. There were also some interesting differences in the distribution of injuries by province. In Newfoundland, Nova Scotia, Alberta and British Columbia, the proportional distribution of injuries exceeded the proportional distribution of population. By contrast, the distribution of injuries in Quebec, Ontario and Saskatchewan were lower than expected based on the population distribution.

Table 2 – Percent distribution of population and injuries in the past year, among children 0-14 years, by selected characteristics, Canada, 1993

Characteristic	Population (000s)	Number injured (000s)	% Distribution of population	% Distribution of injured children
Age group				
0-4	2,000	169	35	30
5-9	1,891	193	33	35
10-14	1,883	196	33	35
Total	5,773	559	100	100
Sex				
Male	2,958	322	51	58
Female	2,815	237	49	42
Rural/Urban				
Urban	3,857	383	67	69
Rural	1,460	157	25	28
Not stated	456	19	8	3
Province				
Newfoundland	127	16	2	3
Prince Edward Island	30	—	—	—
Nova Scotia	185	26	3	5
New Brunswick	150	20	3	4
Quebec	1,395	112	24	20
Ontario	2,113	197	37	35
Manitoba	245	23	4	4
Saskatchewan	238	15	4	3
Alberta	606	78	10	14
British Columbia	685	71	12	13

Source: General Social Survey, 1993

Note: — cell size too small to provide a reliable estimate

Month and time

As seen in Table 3, far more injuries occur between April and October than in other months. This, no doubt, reflects the greater exposure to risks during warm weather. Similarly, the afternoon peak, when nearly half of all injuries occur, is also almost certainly a reflection of exposure to risk during that time.

Table 3 – Distribution of injuries among children aged 0-14 years, by month of injury and time of injury, Canada, 1993

Month/Time of injury	Number of injuries (000s)	% Distribution of injuries
Month		
January/March	101	19
April/June	155	28
July/September	153	28
October/December	138	25
Missing	11	
Total	559	100
Time		
6:01am to 12 pm	123	22
12.01 pm to 6 pm	275	49
6.01pm to midnight	128	23
12:01am to 6:00 am	4	1
Missing	28	5
Total	559	100

Source: General Social Survey, 1993

Location

As shown in Table 4, over half of all injuries occurred at home (52%). The code "commercial" refers to locations like restaurants, shopping malls, sports facilities and commercial buildings.

Table 4 – Location where injury occurred, children aged 0-14 years, Canada, 1993

Characteristic	Number of injuries (000s)	% Distribution of injuries by location
Location of injury		
Home	290	52
Commercial building	154	28
Public places	87	16
Elsewhere	15	3
Missing	13	2
Total	559	100

Source: General Social Survey, 1993

Activity

Not surprisingly, perhaps, in view of the age group under consideration, nearly two thirds of all injuries were coded as taking place during "play." Each of the other activity categories (personal activities, bicycle, sports, etc.) represent only between 4% and 6% of the total. (See Table 5.)

Table 5 – Activity when injury occurred, children aged 0-14 years, Canada, 1993

Activity	Number of injuries (000s)	% Distribution of injuries
Play	366	66
Personal activities	21	4
Bicycle	24	4
Sports	34	6
Passenger in vehicle	22	4
Other	82	14
Missing	11	2
Total	559	100

Source: General Social Survey, 1993

Nature of injury

Table 6 shows the nature or type of injury experienced. Notably, over 50% are clearly minor (e.g. bruises, abrasions, cuts or scrapes). However, most of the remainder are potentially serious: fractures accounting for 12%, followed by poisoning (6%), concussions (4%), internal injuries (3%), and burns and scalds (2%).

Table 6 – Type of injury, children aged 0-14 years, Canada, 1993

Type of injury	Number of injuries (000s)	% of injured
Fracture	65	12
Burn, scald	13	2
Dislocation, sprain, strain	72	13
Bruise, abrasion	107	20
Cut, scrape	174	32
Concussion	22	4
Poisoning	32	6
Internal	14	3
Other	121	22

Source: General Social Survey, 1993

Note: Total of injuries may exceed 100% because of multiple responses to question.

Body part

The information in Table 7 is also disquieting: it suggests that 40% of all injuries involved the head or neck. Although this does not, of course, mean injuries to the brain (for, as noted previously, only 4% were said to have suffered a concussion), it is noteworthy.

Table 7 – Part of body injured, children aged 0-14 years, Canada, 1993

Site of injury	Number of injuries (000s)	Injuries as a percent of total injuries
Eyes	14	3
Head or neck	223	40
Upper extremity (shoulder, arms, hands)	139	25
Lower extremity (hip, legs, feet)	134	24
Back or spine	12	2
Trunk	43	8

Source: General Social Survey, 1993

Note: Total of injuries may exceed 100% because of multiple responses to question.

Site of care

Most of the injured were seen at a hospital (60%) and 10% of those seen initially at a doctor's office or clinic were later seen at a hospital. Given that this is a national sample and that there are only 10 children's hospitals in Canada, it is not surprising that the hospital in question was a children's hospital in only 15% of all cases. As a further indication of the gravity of many of the injuries reported, however, 9% of the children who were taken to hospital spent one or more nights as a hospital in-patient. (See Table 8.) Of the 559,000 children who had experienced an injury in the past year, 33,000 spent at least one night in hospital. This represents about 6% of all injured children.

Table 8 – Where injured child received medical care, children aged 0-14 years, Canada, 1993

	Number of injuries (000s)	% Of injured
Location of treatment		
Hospital emergency department	335	60
Doctor's office	113	20
CHC (clinic)	84	15
Not treated	14	3
Subsequent hospital visit[1]		
Yes	20	10
No	178	90
Treatment in a children's hospital[2]		
Yes	48	15
No	307	85
At least one night stay in hospital[3]	33	9

Source: General Social Survey, 1993

Note: 1. If child was taken to a private health professional's office or a community health clinic (198,000), the question whether the child went to hospital was asked.

2. The question relating to the type of hospital was asked of all children who were taken to a hospital facility. Denominator for percentage is all children who were taken to hospital (355,000).

3. Based on children who were taken to a hospital emergency department or were taken to hospital after preliminary treatment in another facility. Denominator for percentage is 355,000.

Commentary

The GSS is a potentially important source of information about childhood injuries. It would be much more helpful, however, if some of the questions and the coding of all questions were adjusted to reflect the world of children and not that of adults. Despite its shortcomings, it provides a solid estimate of the frequency of injuries over a broad age range and main patterns of their occurrence. It also calls attention to the importance of hospitals in general, and children's hospitals in particular, as a site of care for these children. Apart from the indication of severity as reflected by hospital use, the results pertaining to body part and type of injury reinforce the belief that a substantial proportion of these injuries are potentially serious.

National Population Health Survey

As described earlier, the National Population Health Survey (NPHS) included questions about injuries that could be answered by those ages 12 and older. Only injuries of sufficient severity to limit normal activities were included, however. In this sense, then, the results are not comparable with those described in the previous section. Of the injuries covered, information was obtained on the number in the past year, type, body part, location, its cause, whether it was work related, and if any preventive precautions were taken to avoid another occurrence, including, for example, helmet use. If a person had more than one injury, information relating to its type, body part and location referred to the most serious of the injuries.

A set of supplemental questions from Health Canada was added to the NPHS to obtain data about health and where care was given. Questions also explored parents' awareness of the causes of death in childhood, sources of information about safety seats, traffic safety, home injury prevention, swimming, bicycle, and first aid for choking.

Because the NPHS is longitudinal, it collects information from the same panel every two years for as long as 20 years. The target population is households in all provinces and territories, except those on First Nation reserves, Canadian Forces bases or some remote areas. A total of 26,430 households are included in the sample (following the procedure described earlier) with a final response rate of approximately 88%.

Occurrence

The NPHS addressed injuries only among those ages 12 to 19 years. To facilitate interpretation, the results are reported for the weighted population of those 12 to 14 years and 15 to 19 years. The younger age group represents 39.3% of the total, or 1.3 million adolescents, while the older group is 60.7%, or 2 million adolescents.

For the group as a whole, 28.8% reported one or more injuries in the past 12 months. Most (19.5%) had a single incident; 5.6% had two; 3.7% had 3 or more. Among the younger group 27% reported having an injury (as defined) in the last 12 months; the figure for the older group was quite similar, 29.6%.

The proportions were somewhat different, however, for boys and girls. Thirty-two percent of the boys aged 12 to 14, and 33% of 15- to 19-year-old boys reported an injury compared with 22% and 26%, respectively, of the younger and older girls. (See Table 9.) Note that the percents stated above are based on the whole population: expressed as a proportion of those injured they would, of course, be quite different. For example, among the injured population, the percent with a single injury was 68% and multiple injuries occurred among 32%.

Table 9 – Injuries in the past 12 months among youth 12-19 years, by age and sex, Canada, 1994/95

Age/Sex	Population (000s)	Number of injuries (000s)	% Injured
Both sexes			
12-14	1,326	365	27
15-19	2,046	606	30
Total	3,372	971	29
Males			
12-14	706	227	32
15-19	1,057	347	33
Total	1,763	574	33
Females			
12-14	620	137	22
15-19	989	259	26
Total	1,609	396	25

Source: NPHS,1994/95

Distribution by province

Injuries were more frequently reported by residents of Manitoba and Alberta for boys, and by those of Saskatchewan and British Columbia for girls. (See Table 10.) The highest rate was seen in Saskatchewan for boys 15 to 19 years (56%) and the lowest of the reliable rates (excluding PEI where the numbers are too small), was found for 15- to 19-years-old girls in Newfoundland and 12- to 14-year-old girls in Nova Scotia. It is difficult to know what to make of these patterns, but the differences seem large enough to suggest that they are not simply random variations.

Table 10 – Injuries among youth aged 12-19 years, by province, age, and sex Canada, 1994/95

Province	Males Age group 12-14	15-19	Total	Females Age group 12-14	15-19	Total
Newfoundland	26	31	28	12	10	11
Prince Edward Island	20	23	21	4	18	12
Nova Scotia	44	30	35	10	20	17
New Brunswick	28	29	28	20	18	19
Quebec	22	22	22	14	22	19
Ontario	31	36	34	19	25	23
Manitoba	53	44	48	29	21	23
Saskatchewan	13	56	35	52	40	45
Alberta	40	45	43	29	33	31
British Columbia	48	32	39	40	37	38

Source: NPHS, 1994/95

It is, perhaps, somewhat easier to observe important patterns when the provinces are grouped into regions, as in the next table. This permits larger aggregations and thus more precision in the estimates. Comparing like with like, that is, similar age and sex groups, it is noteworthy that the rates in British Columbia are the highest throughout, with the single exception of 15- to 19-year-old boys, where they are exceeded by those in the Prairies. Just as striking as this consistency are the large relative risks between the highest and lowest regions. In the case of 12- to 14-year-old boys, those in British Columbia have more than twice the risk of being injured than those in Quebec; the same is true for the Prairies compared to Quebec for the older boys. For girls the differences are even greater – younger teenagers in British Columbia have nearly three times the risk of those in the Atlantic region or Quebec, and nearly twice the risk when British Columbia rates are compared with those in Atlantic Canada for the older girls. (See Table 11.)

Table 11 – Injuries among youth aged 12-19 years, by region, age and sex, Canada, 1994/95

Region	Males Age group 12-14	15-19	Total	Females Age group 12-14	15-19	Total
Atlantic	32	29	30	14	17	16
Quebec	22	22	22	14	22	19
Ontario	31	36	34	19	25	23
Prairies	36	47	42	34	31	32
British Columbia	48	32	39	40	37	38

Source: NPHS, 1994/95

Urban vs rural

There is considerable interest and debate about whether urban children have more or fewer injuries than those living in rural areas. Table 12 reveals that for older but not younger boys, those in rural areas have higher rates. For girls, the pattern is reversed. There is no generally accepted explanation for the higher rural rates, although there are several theories. For example, it is assumed that the rural environment is more dangerous, and especially so if youth in rural areas are working on farms, either those of their families or others. Moreover, although motor vehicle crashes may be less frequent in rural areas, their consequences may be more serious because of higher speeds and less readily available emergency medical services. Why these explanations apply to some age-sex groups but not others remains unexplained.

Table 12 – Injuries in the past 12 months among youth aged 12-19 years, by rural/urban status, sex and age, Canada, 1994/95

Age/Sex	Population (000s)	Number of injuries (000s)	% Injured
Both sexes			
Urban			
12-14	1,056	297	28
15-19	1,670	485	29
Total	2,727	782	29
Rural			
12-14	263	67	25
15-19	365	118	32
Total	627	185	29
Males			
Urban			
12-14	562	185	33
15-19	863	265	31
Total	1,425	450	32
Rural			
12-14	141	42	29
15-19	188	81	43
Total	329	123	37
Females			
Urban			
12-14	495	111	23
15-19	807	221	27
Total	1,302	332	26
Rural			
12-14	121	25	21
15-19	177	37	21
Total	298	62	21

Source: NPHS,1994/95

Nature or type of injury

As shown in Table 13 below, for both sexes and both age groups the dominant injury was coded as a sprain or strain. This involved 12.3% of the total population, followed by fracture, 5.8%, and cuts or scrapes, 2.2%. All other types of injuries occurred less often except those labelled "ill-defined" and "other." These basic patterns are the same in all four age and sex groups.

Table 13 – Percent injured by nature of injury, youth aged 12-19 years, by age, Canada, 1994/95

Nature of injury	Age group 12-14	Age group 15-19	Total
Population (000s)	**1,326**	**2,046**	**3,372**
Multiple injuries	—	—	—
Fractures	6.9	5.1	5.8
Burns/Scalds	0.1	1.0	0.6
Dislocation	1.0	2.4	1.9
Sprain/Strains	12.1	12.5	12.3
Cut/Scrapes	1.8	2.5	2.2
Bruise	2.4	1.3	1.7
Concussion	0.7	0.2	0.4
Poisoning	—	—	—
Internal injuries	—	0.7	0.4
Other	2.4	3.6	3.1

Source: NPHS, 1994/95

Note: Denominator for rates is the total population within each age group.

— cell size too small to provide a reliable estimate

In Table 14 and those that follow in this section, the data are also displayed as percentages of all those who are injured in the weighted sample. Viewed in this context, the importance of fractures, dislocations, concussions, burns, scalds and multiple injures (i.e. all those likely to be serious) is seen in a different light: together they represent 33% of boys' injuries and 28% of all injuries to girls (data not shown).

Table 14 – Percent distribution of injuries among youth aged 12-19 years, by nature of injury, Canada 1994/95

Nature of injury	Age group 12-14	15-19	Total
Total injuries (000s)	**365**	**606**	**971**
Multiple injuries	—	—	—
Fractures	25.2	17.2	20.2
Burns/Scalds	0.2	3.2	2.1
Dislocation	3.8	8.2	6.5
Sprain/Strains	44.1	42.1	42.8
Cut/Scrape	6.6	8.3	7.6
Bruise	8.7	4.3	6.0
Concussion	2.6	0.6	1.3
Poisoning	—	—	—
Internal injuries	—	2.3	1.4
Other	8.8	12.1	10.9

Source: NPHS, 1994/95

Note: Denominator is the population within each age group who experienced an injury.

— cell size too small to provide a reliable estimate

Although it is true that 40% to 50% of all injuries are strains and sprains which may be regarded as not serious, nevertheless, as stated above, there is a substantial proportion with concussions and fractures. The former occurs far more often among boys, but the latter are equally frequent in both sexes (data not shown).

Distribution by body part

Injuries involving the lower extremities were most common, 13.6%, followed by upper extremity injuries. Arms or hands were involved in 6% of youth injuries. Back or spine injuries occurred among 3% of youth. (See Table 15.) The percent distribution of injuries reflect the prevalence by body site. The lower extremity (hips, legs or feet) was most often involved in 48%, upper extremity (shoulder, arms, hands) in 26%; and the back, spine or trunk in 14%. This general pattern is consistent in all the age/sex sub-groups (data not shown).

Table 15 – Body part injured, youth aged 12-19 years by age, Canada, 1994/95

Site of injury	Age Group		
	12-14	15-19	Total
Population (000s)	**1,326**	**2,046**	**3,372**
Multiple	—	—	—
Eyes	—	—	0.4
Head	1.8	1.3	1.5
Neck	—	0.7	0.9
Shoulder	1.2	1.7	1.5
Arms/Hands	7.5	5.0	6.0
Hip	—	—	—
Legs /Feet	13.1	14.0	13.6
Back/Spine	1.4	4.2	3.1
Trunk	0.7	1.1	0.9
Other	—	—	—

Source: NPHS, 1994/95

Note: Denominator for rates is the total population within each age/sex group.

— cell size too small to provide a reliable estimate

Most injuries involve arms and legs in adolescents of both sexes, although boys are more often affected than girls. For some reason, arms are more often injured in the 12- to 14-year-olds than in 15- to 19-year-olds of both sexes. The excess of head injuries among boys is noteworthy, however, and in this case the sex differences are larger than for most other body parts (data not shown).

Table 16 – Percent distribution of injuries among youth aged 12-19, by body part injured, by age, Canada, 1994/95

Site of injury	Age group 12-14	15-19	Total
Total injuries (000s)	**365**	**606**	**971**
Multiple	—	—	—
Eyes	—	—	0.4
Head	6.5	4.4	5.2
Neck	—	2.5	3.2
Arms/Hands	27.2	17.0	20.9
Hip	—	—	—
Legs /Feet	47.7	47.2	47.4
Back/Spine	5.2	14.3	10.9
Trunk	2.7	3.6	3.3
Other	—	—	—
Total	100.0	100.0	100.0

Source: NPHS, 1994/95

Note: Denominator for rates is the total population within each age/sex group.

— cell size too small to provide a reliable estimate

Distribution by locale

The coding of locale was not entirely appropriate for children. Assuming that "industrial location" was equivalent to place of work, the dominant locales for injuries in the total population aged 12 to 19 years were recreational facilities (15.5%), home (6%), and on streets, about 3%. (See Table 17.) The distribution of injuries among children who were injured (Table 18), varied, predictably, by the age of the child. About 54% of all injuries occurred in a recreational facility, followed by 20% in the home, and about 10% in the street. Among children aged 12 to 14, about 25% of injuries occurred in the home, compared to 19% in the 15 to 19 age group.

Table 17 – Location of injury, youth aged 12-19 years, by age, Canada,1994/95

Location	Age group 12-14	15-19	Total
Population (000s)	**1,326**	**2,046**	**3,372**
Home	6.7	5.5	6.0
Farm	—	—	0.4
Recreational facility	15.7	15.4	15.5
Street	1.7	3.7	2.9
Public building	2.5	2.3	2.4
Industrial location	—	0.6	0.4
Other	—	1.6	1.2

Source: NPHS, 1994/95

Note: Denominator for this table is the total population within each age group.

— cell size too small to provide a reliable estimate

Table 18 – Percent distribution of injuries by location of injury, youth aged 12-19 years, by age, Canada, 1994/95

Location	Age group 12-14	15-19	Total
Number injured (000s)	**365**	**606**	**971**
Home	24.5	18.7	20.9
Farm	—	—	1.3
Recreational facility	57.0	52.0	53.9
Street	6.0	12.3	10.0
Public building	9.2	7.9	8.4
Industrial location	—	2.0	1.2
Other	—	5.5	4.2
Don't know	—	—	—
Total	100.0	100.0	100.0

Source: NPHS, 1994/95

Note: Denominator for this table is youth who experienced an injury in the past year.

— cell size too small to provide a reliable estimate

The patterns by sex are, again, interesting. Even in adolescence, girls have more injuries than boys in the home, whereas the reverse is true for recreational injuries, which are, presumably, for the most part, sports related (data not shown).

Distribution by external cause

Here again, the coding is based on adult mechanisms, so that categories like natural environment, corrosive, and machinery are somewhat difficult to interpret. Nonetheless, it is notable that falls clearly predominate. The next largest category is struck, followed by MVA. Although this latter proportion may appear small, it represents over 56,000 victims! It is also noteworthy that the injury rates due to MVAs increases sharply in both sexes between the two age groups (data not shown).

Table 19 – External cause of injury among youth aged 12-19 years, by age, Canada, 1994/95

External cause	Age group		Total
	12-14	15-19	
Population (000s)	**1,326**	**2,046**	**3,372**
Motor vehicle accident	—	2.2	1.7
Fall	15.5	12.4	13.6
Struck	4.9	4.2	4.5
Assault	—	0.7	0.5
Environmental	—	1.0	0.9
Cut	—	—	0.3
Other	5.1	8.7	7.3

Source: NPHS, 1994/95

Note: Denominator for this table is the total population within each age group.

— cell size too small to provide a reliable estimate

The other category includes injuries from corrosive products, machinery, poisoning, fires and residual categories for which the cell count was too low to yield reliable estimates.

The distribution of injuries by external cause of injury indicates that about 47% of all injuries were attributable to falls compared to 16% for accidental strikes and 6% for MVA. There are age differences in the distribution of injuries. Among youth aged 12 to 14, 56% of all injuries were associated with falls compared to 42% in the 15 to 19 age group. (See Table 20.)

Table 20 – Percent distribution of injuries among youth aged 12-19, by age and external cause of injury, Canada, 1994/95

Location	Age group		
	12-14	15-19	Total
Number injured (000s)	**365**	**606**	**971**
Motor vehicle accident	—	7.3	5.8
Fall	56.4	41.9	47.3
Struck	17.9	14.3	15.7
Assault	0.4	2.3	1.6
Environmental	—	3.4	3.1
Cut	—	—	1.1
Other/Don't know	18.5	29.5	25.4
Total	100.0	100.0	100.0

Source: NPHS, 1994/95

— cell size too small to provide a reliable estimate

The other category includes injuries from corrosive products, machinery, poisoning, fires and residual categories for which the cell count was too low to yield reliable estimates.

It is unclear from the preceding table how many of these injuries are work-related. This is, however, an important problem that has begun to receive increasing attention worldwide. Respondents who experienced an injury in the past year were asked, "Was this a work-related injury?" From Tables 21 and 22, it appears that about 3% of this age group responded "yes" – they were injured at work, (i.e. about 5% of all those injured). The problem is, not surprisingly, much greater among older adolescents, and twice as great for boys than girls.

Table 21 – Work-related injury among youth aged 12-19 years, by age and sex, Canada, 1994/95

Age/Sex	Population (000s)	Number injured in work-related activity (000s)	% Injured
Both sexes			
12-14	1,326	—	—
15-19	2,046	52	1.6
Total	3,372	53	2.5
Males			
12-14	706	—	—
15-19	1,057	38	3.6
Total	1,763	38	2.1
Females			
12-14	620	—	—
15-19	989	14	
Total	1,609	15	1.5

Source: NPHS, 1994/95

— cell size too small to provide a reliable estimate

Table 22 – Work-related injury among youth aged 12-19, by age and sex, Canada, 1994/95

Characteristic	Population (000s)	Number injured (000s)	Number injured in work-related activity	Work-related as % of all injured
Age group				
Both sexes				
12-14	1,326	365	—	—
15-19	2,046	606	52	9
Total	3,372	971	53	5
Males				
12-14	706	227	—	—
15-19	1,057	347	37	11
Total	1,763	574	38	7
Females				
12-14	620	137	—	—
15-19	989	259	14	5
Total	1,609	396	15	2

Source: NPHS, 1994/95

— cell size too small to provide a reliable estimate

Distribution by income

Many reports, including several from Canada, have called attention to a strong, linear relationship between income and injuries, especially among children. That relationship suggests that children from low-income families have many more injuries, including fatalities, than those from wealthy families. In light of this, the results seen in Table 23 are puzzling: among 12- to 14-year-old boys the pattern is curvilinear, with highest rates found for both the poor and the rich. Among both male and female 15- to 19-year-olds, however, the pattern is the reverse of what is expected: rates are highest for the rich, not the poor. This needs to be examined more carefully. One possible explanation is that wealthier youth have more access to cars and other dangerous recreational vehicles or equipment, including skis, snowboards, in-line skates, snowmobiles, etc.

Table 23 – Injuries among youth aged 12-19 years, by household income, and sex, Canada, 1994/95

Sex/Household income	Population (000s)	Number injured (000s)	% Injured
Both sexes			
Lowest	625	174	28
Lower middle	1,072	275	26
Upper middle	974	287	29
Highest	524	187	36
Missing	178	48	27
Males			
Lowest	338	118	35
Lower middle	559	156	28
Upper middle	476	154	32
Highest	304	123	40
Missing	86	24	28
Females			
Lowest	287	56	20
Lower middle	513	119	23
Upper middle	498	133	27
Highest	220	65	29
Missing	92	24	26

Source: NPHS, 1994/95

Bicycle injuries

Bicycle injuries are important because they can have serious consequences and because the use of helmets can prevent many of these consequences. Unfortunately, many accounts of these injuries fail to use bike ownership or actual use as a measure of exposure. Most children ride bicycles or tricycles. In 1994/95, 62% of parents with a child aged 12 or younger reported that their child rode a bicycle or tricycle. The percentage ranged from 59% in Quebec to 66% in British Columbia. (See Table 24.) Rural or urban residence had little relationship to bicycle or tricycle use, but differences by household income were notable.

Use of bicycle helmets differed depending on where they lived. Nationally, 58% of parents reported that their child who rode a bicycle or tricycle always wore a helmet, but the figure varied from 44% in the Prairies to 65% in Ontario and British Columbia. Use rates were relatively lower in rural areas. Whereas 59% of parents in urban communities reported that their child always wore a helmet, the figure was 34% in rural areas. Differences in helmet use by household income were also striking. Of children in the highest income households, 69% wore helmets, compared to 50% or less in the two lowest income groups. (See Table 24.)

Table 24 – Bicycle* use and helmet use, children aged 12 and younger by region, rural/urban residence, and household income, Canada, 1994/95

Parents of ...	Child 12 and younger † (000s)	Children use bicycle (000s)	Bicycle use rate % of population	Child always wore helmet (000s)	Helmet use rate % of bicycle users
Total	**5,883**	**3,619**	**62**	**2,084**	**58**
Region					
Atlantic	463	288	62	168	58
Quebec	1,441	844	59	428	51
Ontario	2,267	1,405	62	912	65
Prairies	990	607	61	268	44
British Columbia	723	474	66	309	65
Rural/Urban ††					
Rural	799	518	65	177	34
Urban	2,793	1,684	60	990	59
Household income ‡‡					
Lowest	235	119	51	60	50
Lower-middle	819	470	57	204	43
Middle	1,799	1,119	62	602	54
Upper-middle	2,036	1,242	61	786	63
Highest	801	534	67	368	69

Source: NPHS, 1994/95

* bicycle refers to two- and three-wheelers (tricycle)

† Based on information provided by parents of children aged 12 and younger; does not reflect the population aged 12 and younger.

†† Rural/Urban does not sum to total because of a category added to ensure confidentiality.

‡‡ Income does not sum to total because of a "not stated" category which is not shown.

In 1994/95, 1.85 million teenagers aged 12 to 19 were bicycle riders. Cycling declined from 62% at ages 12 to 14 to 49% at ages 15 to 19. Teenage boys were more likely than girls to be cyclists. Rates of helmet use among teenagers were much lower than among children, and fell sharply among older teenagers. At ages 12 to 14, 16% of cyclists always wore a helmet, but by ages 15 to 19, the percentage was just 8%. Overall, the rate of helmet use by teenage boys was somewhat higher than that for girls. (See Table 25.)

Table 25 – Bicycle use and helmet use, among youth aged 12 and older, by sex and age group, Canada, 1994/95

Age/Sex	Population (000s)	Bicycle users † (000s)	Bicycle rate % of population	Helmet users ‡ (000s)	Helmet use rate % of bicycle users
Both sexes					
12-14	1,312	820	62	133	16
15-19	2,088	1,029	49	85	8
Total	3,400	1,849	54	218	12
Males					
12-14	686	508	74	105	21
15-19	1,082	637	59	42	7
Total	1,771	1,145	65	197	17
Females					
12-14	626	312	50	28	9
15-19	1,006	391	39	43	11
Total	1,632	703	43	51	7

Source: NPHS, 1994/95

† Based on respondents who cycled in the past three months.

‡ Bicycle users who always wear a helmet.

National Longitudinal Survey of Children and Youth

This survey represents a sharp departure from most other health surveys undertaken in Canada (and, elsewhere, for that matter). With the exception of the NPHS, most other health surveys are cross-sectional whereas the design of the NLSCY is longitudinal. Through a complex sampling procedure, described in detail in the following section, it is intended to follow the growth, health, and development of a representative sample of children from infancy to adulthood. In this respect, the NLSCY is similar to the British Birth Cohorts and the U.S. National Longitudinal Survey of Youth, and is certain to provide equally valuable information.

Survey methodology

To select a representative sample of Canadian children the original target population (Cycle 1) was children from birth to age 11. The starting point was a household from three possible sources, labelled the Main Component, the Integrated Component, and the Territories Component. For cycle 1, the main requirement was to select households with children 0 to 11 years of age. To find such families (about 26% of all), a link was made to Statistics Canada's Labour Force Survey. This survey is conducted monthly and obtains information about all household members from a representative sample. Households with children that were recently in that sample served as the basis for the Main Component and from this approximately 12,900 households were selected. As the Labour Force Survey excludes the Yukon and Northwest Territories, a special "Territories" Component was added. Finally, because both the NLSCY and the NPHS needed to collect data on the health of Canadian children, it was decided that a portion of the sample and content of the two surveys would be integrated for the 10 provinces. Thus, children selected by the NPHS were part of the sample for both surveys (the Integrated Component).

Once a sample of households was selected, one child in the specified age group was randomly selected followed by up to four others from the same family. The sampling procedure was constructed to yield a sufficiently large sample in each of the provinces to ensure acceptable estimates in each of seven age groups: 0 to 11 months, ages 1, 2 to 3, 4 to 5, 6 to 7, 8 to 9, and 10 to 11 years. The goal was to permit new analyses every two years for each of these age cohorts and at the same time to maintain an emphasis on those younger than age 2.

Most provinces had a sample between 1,000 and 2,000; Quebec and Ontario had 4,000 and 6,000, respectively. In each single-year age group the sample was, likewise, about 1,800 except for the 0- to 1-year-olds, where the number was 2,227, and the 1- to 2-year-olds, where it was 2,469. At each successive wave, or cycle, those previously in the sample were revisited; newborns were replaced; and, eventually, those "graduating" will be dropped.

Unfortunately, at the time this report was being completed, the results of the second cycle were not available for analysis. Consequently, the data reported here are, in one respect, similar to those from other surveys in this report, while in another respect they are fundamentally different. They are similar insofar as they describe a sample of children at a single point in time. The sampling scheme is, however, basically different because it is not based on a sample of households but rather on families with children, and the design is clearly longitudinal. Thus, much of the information collected is intended to provide a baseline for information to be collected later on the same child.

Questions related to injury occurrence were part of a "buy-in" by Health Canada. The exact wording of the filter used was: "The following questions refer to injuries, such as a broken bone, bad cut or burn, head injury, poisoning or sprained ankle, which occurred in the past 12 months, and were serious enough to require medical attention by a doctor, nurse, or dentist. In the past 12 months was the child injured?" At a later point, the parent is asked "How many times was he/she (the child) injured?" and the questions that follow referred to the most serious injury (e.g. what type of injury did he/she have – broken or fractured bones, burn or scald, etc.?)

The sampling design for the first wave only included children up to age 11 years. A total of 22,831 children were included in this wave, with 46% between birth and 4 years of age; 38.8% between 5 and 9 years; and 15% ages 10 or 11 years. In part because of this age distribution, all responses to questions about injury were given by a proxy respondent. In most cases this was a parent, usually the mother. The weighted estimates yield a population of over 4.7 million children.

Overview of injuries

Of the 4.7 million children aged 0 to 11, 10.2% experienced at least one injury during the previous year. This estimate represents about 468,000 children. Among both boys and girls the injury rate increased with age and in every age group, the prevalence was higher among boys than among girls. Overall, 11% of boys experienced an injury compared to 9% of girls. (See Table 26.)

Table 26 – Number and percent of children aged 0-11 years injured in the past year by age and sex, Canada, 1994/95

Age/Sex	Population (000s)	Number injured (000s)	% Injured
Both sexes			
0-4 years	1,931	166	8.6
5-9 years	1,898	191	10.1
10-11 years	777	111	14.3
Total	4,605	468	10.2
Males			
0-4 years	992	96	9.7
5-9 years	963	109	11.3
10-11 years	396	59	14.8
Total	2,352	264	11.2
Females			
0-4 years	939	69	7.4
5-9 years	934	83	8.8
10-11 years	380	53	13.9
Total	2,254	204	9.1

Source: National Longitudinal Survey of Children and Youth, 1994/95

The leading types of injury were cuts, scrapes or bruises (40.3%), fractures (23.7%), sprains or strains (12.3%), and other (7.2%). This pattern is similar to that found in the other surveys.

Among those children who experienced an injury in the past year, injuries involving the arms or legs accounted for 45% while the face, head or neck accounted for another 30%.

Most injuries involved falls (53%), followed by sports (14%). (It is not clear how a fall during sports would be coded, but these categories are mutually exclusive.) Notably, only 3% of all injuries were MVA, divided almost equally between passengers, pedestrians and bicyclists. Also of note, intentional injuries were reportedly rare; 2% of the total were said to have been assaulted, and a further 1% were intentionally injured in some other way. In light of the age distribution of the sample, it is not surprising that most injuries (34%) occurred in the home (data not shown).

Cause of injury by age

In Table 27 the distribution by cause of injury is shown for each of the age groups. As in all such tables that follow, the figures shown are the percent of children in each age group whose parents reported an injury during the past 12 months.

Table 27 – External cause of injury among children aged 0-11 years by age group, Canada, 1994/95

	Age group			
	0-4 years	5-9 years	10-11 years	Total
Number injured (000s)	**165**	**191**	**111**	**467**
External cause of injury				
MVA-Passenger	—	—	—	0.8
MVA-Pedestrian	—	—	—	0.5
MVA-Bicyclist	—	—	—	0.7
Other bicyclist	1.4	5.9	3.9	3.8
Falls	57.9	47.5	39.0	49.2
Sports	—	13.6	37.7	15.1
Assault	2.2	3.3	—	2.3
Scalds	4.6	—	—	3.0
Fire/Flames	—	—	—	0.2
Accidental poisoning	—	—	—	—
Intentional poisoning	—	—	—	—
Intentional injury	—	—	—	1.4
Natural/Environment	3.5	3.4	2.1	3.1
Other	21.2	19.6	13.7	18.7
Total	100.0	100.0	100.0	100.0

Source: National Longitudinal Survey of Children and Youth, 1994/95

— cell size too small to provide a reliable estimate

One noteworthy feature in this table is that there appear to be few strong age gradients. The only injury showing a definite increase with age is that related to sports; several others (i.e. pedestrians, falls and poisoning) show an inverse relationship, with the highest proportion of each occurring among the youngest age group and the smallest among the older children. There are also some instances where the relationship is curvilinear; the highest rates occurring among the 5- to 9-year-olds. These include motor vehicle passengers, bicyclists and assaults.

Type of injury by age

Using weighted data to examine variations by age group shows some striking variations for fractures, sprains and strains. These are seen proportionately more often with increasing age, whereas, for example, the opposite is true for burns and scalds, and, to a lesser extent for dislocations. (See Table 28). It seems reasonable to assume that most of these variations can be accounted for by differences in exposure to risk in these age groups.

Table 28 – Percent distribution of injuries among children aged 0 to 11 years, type of injury by age group, Canada, 1994/95

	Age group			
	0-4	5-9	10-11	Total
Number injured	**165**	**191**	**111**	**467**
Type of injury				
Fracture	12.6	24.9	38.2	23.7
Burn/Scald	7.6	4.2	—	4.6
Dislocation	6.7	1.1	—	2.9
Sprain/Strain	6.1	11.1	23.7	12.3
Cut/Scrape/Bruise	49.0	40.9	26.6	40.3
Concussion	4.5	4.4	1.7	3.8
Poisoning	0.9	—	—	0.6
Internal	—	—	—	0.6
Dental	2.9	4.3	2.3	3.3
Other	9.1	7.1	4.4	7.2
Multiple	—	—	—	—
Total	100.0	100.0	100.0	100.0

Source: National Longitudinal Survey of Children and Youth, 1994/95

— cell size too small to provide a reliable estimate

Body part by age

In Table 29, the body parts injured are shown by the same age groupings. The body part grouping has some overlap (e.g. arms/legs vs legs/feet) and this needs to be kept in mind. Respondents were asked, "For the most serious injury, what type of injury did he/she have?"

Table 29 – Percent distribution of injuries among children aged 0-11, by body part injured, Canada, 1994/95

	Age group			
	0-4	5-9	10-11	Total
Number injured (000s)	**135**	**157**	**100**	**392**
Body part				
Eyes	2.2	—	—	1.3
Face	28.6	18.0	6.2	18.7
Head/Neck	22.9	15.5	5.0	15.4
Arms/Hands	24.0	31.6	40.0	31.1
Legs/Feet	15.1	23.8	37.1	24.2
Back/Spine	—	—	—	1.5
Trunk	1.0	2.3	—	2.1
Shoulder	4,6	5.9	—	5.1
Hip	—	—	—	—
Multiple sites	—	—	—	—
Total	100.0	100.0	100.0	100.0

Source: National Longitudinal Survey of Children and Youth, 1994/95

— cell size too small to provide a reliable estimate

Note: The question relating to the site of the injury was asked only of children who suffered a fracture, burn or scald, dislocation, sprain or strain, or cut, scrape or bruise.

One striking age-related pattern revealed in the table above is the proportion of injuries involving the head (including eyes, head and neck). The pattern is strongly inverse; that is, the younger the child the greater the proportion of all injuries involving the head. The distribution of injuries among the youngest age group probably reflects the hazards associated with learning to walk. Among children age 0 to 4 years, about 29% of injuries involved the face and 23% the head or neck. Among those ages 5 to 9, injuries to the arms or hands accounted for about 32% of all injuries, and among 10- to 11-year-olds 40% of injuries were to the arms/hands and 37% to the legs or feet.

Place of injury by age

Table 30 shows the distribution of injuries in each age group according to the place where the injury reportedly occurred. Again, the reader is cautioned that these categories do not appear to be mutually exclusive and some arbitrary decisions were made in the coding.

Table 30 – Percent distribution of injuries among children aged 0-11, by age group and place injury occurred, Canada, 1994/95

	Age group			
	0-4	5-9	10-11	Total
Number injured (000s)	**165**	**191**	**111**	**467**
Place injury occurred				
Home	57.7	21.5	12.2	32.1
Outside home	16.4	22.4	23.2	20.5
Other private residence	10.0	10.9	3.8	8.9
School/Day care	4.3	18.6	27.0	15.5
Sports facility	—	9.9	19.9	9.2
Other public building	3.6	3.0	—	2.7
Sidewalk or road	—	4.9	4.5	3.6
Other park or play ground	2.0	3.0	4.0	2.9
Other location	3.3	5.9	4.7	4.7
Total	100.0	100.0	100.0	100.0

Source: National Longitudinal Survey of Children and Youth, 1994/95

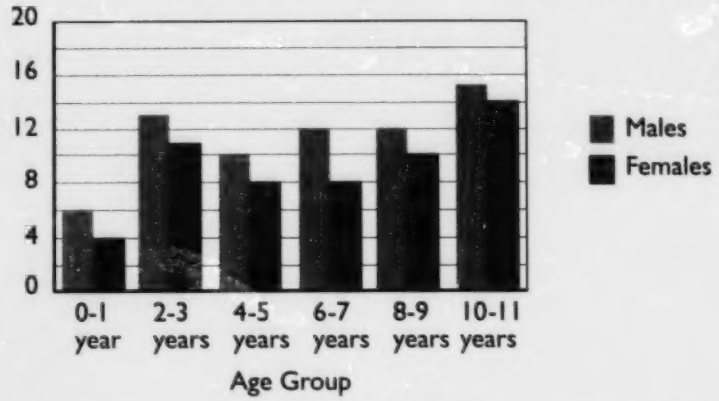
— cell size too small to provide a reliable estimate

The patterns are very largely related to age: the youngest age group having the greatest proportion of injuries in the home, while outside home, school or neighbourhood are more often seen among older children. This, no doubt, reflects exposure to risk and little more.

Sociodemographic factors

Figure 1 shows what appears to be a tendency for the rate of injuries to occur with greater frequency with age. The rate rises sharply from 5% for those 0 to 1 years old to 14% for the 10- to 11-year-olds. But when these trends are examined in two-year increments, it seems that after the age of 2 there is little further increase each year. As noted previously, the age-related patterns are of greater importance than any age/sex combinations. The generally higher injury rate among boys is consistent with previous research.

Figure 1 – Percent of children aged 0-11 years, injured in the past year, by age and sex



National Longitudinal Survey of Children and Youth 1994-95

Table 31 showing injury rates by province is intriguing.

Table 31 – Number and percent of children aged 0-11, injured in the past year, and percent distribution of injured children by province, Canada, 1994/95

Province	Population (000s)	Number injured (000s)	% Injured	% Of injured by province
Newfoundland	89	9	9.7	1.9
Prince Edward Island	23	2	7.5	0.5
Nova Scotia	144	18	12.4	3.1
New Brunswick	115	10	9.0	2.5
Quebec	1,091	102	9.3	23.7
Ontario	1,761	173	9.8	38.2
Manitoba	180	16	9.0	3.9
Saskatchewan	170	19	11.3	3.7
Alberta	470	50	10.7	10.2
British Columbia	562	69	12.3	12.2
Canada	4,605	468	10.2	100.0

Source: National Longitudinal Survey of Children and Youth, 1994/95

Bearing in mind that the national average is 10.2%, it is evident that children in certain provinces, generally those in the west, are injured more often than those in the east, with the exception of Nova Scotia. Compared with the province with the lowest rate, Prince Edward Island (7.5%), the rate in British Columbia is 60% higher. It is difficult to explain why this is so but may reflect greater exposure because of climatic conditions, or sharply different provincial prevention policies.

A related, but contrasting finding is that pertaining to rural vs urban differences. Unlike many of the results pertaining to hospitalizations reported by Hodge and Pless (1995), in the case of injuries the rate is 10.3% for those in urban areas compared with 9.7% for those in rural areas – essentially identical.

Injury and income adequacy

Table 32 shows no apparent relationship between reported injuries and income adequacy. This is striking. In fact, unexpectedly, those in families with the lowest income adequacy actually have a lower proportion with injuries than any of the other income bracket families. The most likely explanation is that those in higher income families are more often exposed to risk (e.g. through greater opportunities to participate in sports).

Table 32 – Percent of youth aged 0 to 11 years, injured in the past year by household income adequacy, Canada, 1994/95

Rank of household income	Population (000s)	Number of injured (000s)	% Injured in past year
Lowest	120	9	7.2
Lower middle	715	76	10.6
Middle	1,452	151	10.4
Upper middle	1,615	160	9.9
Highest	704	73	10.3

Source: National Longitudinal Survey of Children and Youth, 1994/95

Note: Household income was missing for 68,000 children.

Another social measure often judged to be a risk factor for childhood injury is single parenthood. In the NLSCY, the rate of injuries for those in two-parent families is 9.8%; for those living with one parent it is 12.2%. Bearing in mind the lack of relationship between income and injury as shown previously, it cannot be concluded that single parenthood is a proxy or correlate of low income. Other factors must be at work.

Injury and parent education

The same is true for parent education – that is, there is no evidence of the gradient that might be expected. However, parent education is, of course, highly correlated with income.

Although the differences are small and likely to be insignificant, it is worth noting that the expected educational gradient is reversed; unlike the results reported by Wilkins et al. (1990), these figures, like those for income, suggest that rates are higher in families where the parent is better educated. (See Table 33.) The differences in the prevalence of injury between the two studies could have been due to the study design in that the Wilkins study employed an ecological design.

Table 33 – Percent of youth aged 0 to 11 years injured in the past year, by mother's education, Canada, 1994/95

Mother's education	Population (000s)	Number of injured (000s)	% injured in past year
Less than high school	755	71	9.4
High school	817	77	9.4
Some post secondary	1,307	140	10.7
College/university	1,719	179	10.4
Not stated	7	—	—

Source: National Longitudinal Survey of Children and Youth, 1994/95

Note: The level of education refers to the person most knowledgeable about the child. In the majority of cases it was the mother.

Other correlates of injury

Although, as stated, at the time of writing, data from the second wave of the NLSCY were not available, in time it will be possible to take full advantage of this powerful longitudinal design. This will permit a thorough examination of predictors or risk factors for injury in a scientifically acceptable manner. At present, however, the best that can be done to mine this rich resource is to examine cross-sectional relationships with other variables. It must be emphasized that in doing so we are not testing hypotheses and, accordingly, no statistical tests are reported. These analyses are basically exploratory or hypothesis generating; nothing more. They are made possible by the fact that the NLSCY included a large number of questions about other social and health problems. It was not unreasonable to explore any possible relations between these and the occurrence of injury.

Medication

Perhaps the most direct (i.e. most plausible relationship), is with Attention Deficit Disorder with Hyperactivity (ADDH). This common problem has often been shown to be associated with injury occurrence, as has over-activity alone. ADDH is commonly treated with the drug Ritalin. In the NLSCY population, the parents of 1% (54,200) of children in the population said that their child was being treated with Ritalin. Thus, not unexpectedly, the prevalence of injury among those who were taking this medication was higher (14%) than among those who were not taking it (10%). (See Table 34.) What cannot be concluded from this is the direction of the effect; that is, whether the occurrence of injury prompted the diagnosis of ADDH and thus the prescription for Ritalin, or whether without the use of Ritalin the rate of injury would be much higher.

A popular misconception is that children with epilepsy are more likely to experience injuries. As most children with this disorder receive anti-convulsants, the relationship was examined. Among children who used epilepsy medication, the prevalence of injury was 18% compared to 10% among children who did not use epilepsy medication.

The possibility that each of the above represents a reporting bias is raised by the fact that when the general question was asked, "Does child take any other medication?," to which nearly 4% of parents said, "yes," a similar but smaller elevation was noted for children who had been injured: 13% versus 10%.

Table 34 – Rates of injury among children aged 0-11 years, by the use of selected medications, Canada, 1994/95

Medication use	% of children injured		
	Children with medication	Children who do not use medication	Relative risk
Use of asthma inhalants	15	10	1.50
Use of Ritalin	14	10	1.40
Use of anti-convulsants	18	10	1.80
Use of any other medication	13	10	1.30

Source: National Longitudinal Survey of Children and Youth, 1994/95

Note: Although the survey also asked about the use of tranquilizers, cell counts were too small to yield reliable estimates.

Diseases

The likelihood of an association between the occurrence of injuries and any specific disease or condition, with the exception of those listed above, (i.e. ADDH and epilepsy) is remote. Nevertheless, we explored such possible associations.

The most common of the diseases reported in a general population survey is allergy of one sort or another. About 14% of the children experienced allergies. Among those children who had allergies, 14% experienced an injury in the past year compared to 10% of those children who did not have allergies. A similar difference was seen in the case of bronchitis. About 3% of children were diagnosed with bronchitis. Among children with bronchitis, 15% suffered an injury in the past year compared to 10% of children who did not have bronchitis. (See Table 35.)

For heart condition, the rates are 19 vs 10 (RR 1.9). The lack of any biological or psychological explanation for these findings suggests they are spurious or due to a reporting bias.

Table 35 – Rates of injury among children aged 0-11 years, by selected diseases or conditions, Canada, 1994/95

Disease/Condition	% of children injured		
	Children with disease	Children without disease	Relative risk
Allergies	14	10	1.40
Bronchitis	15	10	1.50
Heart condition	19	10	1.90
Learning disability	18	12	1.50
Emotional problems	24	12	2.00
Limited in normal activity	14	10	1.40
Any worry or unhappiness in past year	15	9	1.66
Mental handicap	8	10	0.80
Other conditions	13	10	1.30

Source: National Longitudinal Survey of Children and Youth, 1994/95

Note: The survey also asked about the prevalence of cerebral palsy, epilepsy and kidney disease, but the cell counts were too small to yield reliable estimates.

For those with learning disability or other conditions the rates are again elevated, with relative risks (RRs) of 1.5 and 1.3, respectively, whereas for those with emotional problems the elevation is striking, revealing a RR of 2.1. It is difficult to know what to make of these findings and the reader is again cautioned that as these are observational, cross-sectional data, no temporal or causal interpretation can be assumed. Nevertheless, it is possible to speculate that some diseases may be protective if they prompt the child or parents to be more cautious. Similarly, as in the case of those with emotional problems, many of which are likely to be of the "acting out" variety, including over-activity, there is some literature that suggests a causal interpretation (i.e. that such children are more likely to be injured).

The reverse in the case of the many disorders with elevated relative risks in the range of 1.5 is also plausible; that is, it is possible, but unlikely, that in some cases the disease may be indirectly the result of an injury. Although not everyone would agree that all the conditions listed in the table are "diseases." In the usual sense, assuming the term applies, it would not be surprising if injuries led to emotional problems, limitations in normal activities, worries and unhappiness, and possibly even mental handicap.

Limitations of activity

The data from this set of analyses are also used to examine the relationship between various measures of limitation of activities or disability. Bearing in mind that these measures are correlated with the diseases described above, whatever the relationship may be, if any, is likely to be accounted for by the underlying disease resulting in the disability reported. Overall, 13.7% of children reported to be limited in their normal activity had been injured in the previous year, compared to 10% of those who had no such limitations. In this case, however, it is even more likely that the injury was responsible for the reported limitations in activity.

General health and well-being

A small but interesting gradient is evident when ratings of general health are considered. Only 8% of children whose health was considered to be excellent experienced an injury in the past year, compared to 10% among children with very good health, 12% among those whose health was good or fair and 16% among those whose health was poor.

Repeated injuries

In the NLSCY, a special set of analyses compared children who were injured more than once in the past year with those who had no injury or only one. It is likely that this was prompted by the view still held by some that there are children who are "accident prone" and that this could be supported if a consistent relationship was found with other variables.

As Table 36 indicates, the basic demographics show that for both sexes, 8.6% of the population had a single injury requiring medical attention while another 1.5% had more than one such injury. The rate of the latter increased with age, from 1% in the 0 to 4 age group, to 1.2% among youth aged 5 to 9, rising to 3.3% in youth aged 10 to 11 years.

Table 36 – Percentage of youth aged 0-11 years with more than one injury in the past year, by age, sex and selected characteristics, Canada, 1994/95

Characteristic	Males	Females	Both sexes
Total			
Age			
0-4 years	1.6	0.5	1.1
5-9 years	1.4	1.1	1.2
10-11 years	3.8	2.3	3.3
Region			
Atlantic	2.7	1.3	2.0
Quebec	2.1	0.5	1.3
Ontario	1.7	1.2	1.5
Prairies	1.5	1.1	1.3
British Columbia	2.1	2.2	2.1
Rural/Urban			
Rural	2.0	1.2	1.6
Urban	1.4	0.9	1.1
Education of mother			
Less than high school	1.7	1.5	1.5
High school	1.5	1.1	1.1
Some post high school	2.2	1.5	1.5
College/University			
Family structure			
Two parents	1.7	1.2	1.5
One parent	3.0	0.7	1.8
Household income			
Lowest/Lower middle	2.4	1.2	1.8
Middle	1.5	0.9	1.2
Upper middle	1.8	1.5	1.7
Highest	2.1	0.7	1.4

Source: National Longitudinal Survey of Children and Youth, 1994/95

These data suggest some tantalizing hypotheses but prove little. Apart from the powerful effect of age, and the expected higher repeat injury rates among boys, there are higher rates in the Atlantic Provinces and British Columbia; for those in rural areas, and no clear trends with parental status or education. In the absence of information about personality or emotional status, the "accident-prone" issue could not be explored further.

Health Promotion Survey (HPS)

This survey, which took place in 1990, involved only youth 15 to 19 years. Respondents were asked to describe many health-promoting behaviours, several of which relate to injury prevention. The sample comprised 1,010 respondents aged 15 to 19.

The profile of the weighted sample, representing nearly 2 million youth (n=1,842,253) is as follows: 51.2% were males, 24.1% were residents of Quebec, 36.5% residents of Ontario, and 11.2% residents of British Columbia. The other provinces account for an average of 3% to 4% each.

The income quartile of over one half (52.6%) of the respondents was not known. Most of the remainder were "lower middle", (26.3%), followed by lowest (13.2%), with 8% falling into the "upper middle" or highest income quartiles. The frequency of various self-reported health behaviours for male and female adolescents are shown in Table 37.

To assess safety in the home, respondents were asked "Do you have the following in your home: a first aid kit, a smoke detector, a fire extinguisher?" The survey also asked respondents "Do you have a household member trained in first aid?" Respondents were asked about their driving behaviour: "*How often do you wear seatbelts when your ride in a car?*" Response options were *always, most of the time, sometimes, rarely and never.* With regard to the use of alcohol while driving, a question was asked, "*In the past 12 months, how many times have you driven within two hours after drinking any amount of alcohol?*" Safety on snowmobiles was assessed by asking *respondents* "*Have you driven an all-terrain vehicle (ATV) or snowmobile in the last 12 months?*" If the response was yes, respondents were asked "*How often do you use seatbelts when you ride in a car?*" Again, the response options were *always, most of the time, sometimes, rarely or never.*

Table 37 – Injury prevention behaviours, among youth aged 15-19 years, by sex, Canada, 1990

Preventive measure	Population (000s)	Number who report yes (000s)	% Who report yes
Both sexes			
Has smoke alarm in house	1,842	1,600	87
Has fire extinguisher in house	1,842	1,117	61
Has first aid kit in house	1,842	1,207	66
Someone in house is trained in first aid	1,842	1,082	59
Always uses seatbelt when driving	1,842	1,245	68
Did not drive within two hours of drinking [1]	1,227	1,070	87
ATV /snowmobile use in past year	1,842	769	42
Wore helmet on ATV or snowmobile [2]	763	445	58
Males			
Has smoke alarm in house	944	858	91
Has fire extinguisher in house	944	595	63
Has first aid kit in house	944	627	66
Someone in house is trained in first aid	944	544	58
Always uses seatbelt when driving	944	607	64
Did not drive within two hours of drinking [1]	682	568	83
ATV /snowmobile use in past year	944	509	54
Wore helmet on ATV or snowmobile [2]	503	314	62
Females			
Has smoke alarm in house	899	742	83
Has fire extinguisher in house	899	521	58
Has first aid kit in house	899	580	65
Someone in house is trained in first aid	899	538	60
Always uses seatbelt when driving	899	638	71
Did not drive within two hours of drinking [1]	545	503	92
ATV /snowmobile use in past year	899	260	29
Wore helmet on ATV or snowmobile [2]	260	131	50

Source: Health Promotion Survey, 1990

Notes: 1. Based on youth who had a driver's licence

2. Based on youth who used an ATV or snowmobile in the past year.

Several points in these data merit comment. First, as self-reports, it must be assumed that these are somewhat exaggerated estimates. Despite this, they tell a cautionary tale. Perhaps surprisingly, the message that appears to have sunk in most is that pertaining to drinking and driving! Only (13%) admitted to having driven in the last 30 days within 2 hours of having an alcoholic drink. Not surprisingly, this proportion was much higher among young men (17%) than young women (8%). On the other hand, the percentage reporting that they "always" used a seat belt was disappointing – only 68% overall. The figure for men (64%) was lower than that for women (71%) and these rates are actually lower than some recent observational surveys suggest. The combination of low seat belt use and inexperience puts these drivers at higher risk.

In light of these findings, it was not surprising to find that among those youth who rode on an all-terrain vehicle or snowmobile in the last year, only 58% stated that they always wore helmets. Unexpectedly, this figure was lower for girls (50%) than boys (62%). Perhaps the girls are more often passengers and thus feel less exposed to risk.

Two questions addressed fires and burns. The first asked if there was a smoke alarm in the home and nearly 87% said there was – somewhat higher in men's homes than women's. The second asked about a fire extinguisher and one was reportedly available in 61% of homes.

There were also two questions about first aid: 66% of respondents said their home had a first aid kit but more importantly, only 59% said that somebody in the household was trained in first aid. Surprisingly perhaps, the percentage was higher for females (60%) than for males (58%).

Discussion (Prepared by Barry Pless)

Most of the national surveys described in this report were sponsored by various branches in Health Canada (previously, Health and Welfare Canada), and conducted by Statistics Canada. Similarly, the provincial surveys tend to have been sponsored by Departments or Ministries of Health and the data collected by these same departments. In light of largely health department sponsorship, at both the national and provincial level, it is unfortunate that so little attention has been paid to the injury problem. It suggests that health departments, federal and provincial, still have difficulty accepting that injuries are every bit as much a health problem as drug taking, AIDS or various infectious diseases.

What have we learned?

The surveys covered in this report provide a picture of childhood injury in Canada that is unlike that available from any other source. Of the alternatives, the most similar is the result provided by Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) – a collaboration project between Health Canada and 16 hospital emergency departments which collects and analyses information on the circumstances of injuries (Health and Welfare Canada, 1993; Mackenzie and Pless, 1999). Although this surveillance system, covering all children's hospitals (and several others) provides far more contextual and demographic information than either of the main alternatives, vital statistics data and those from hospital discharges, it is fundamentally different in one important respect. The difference lies in the extent to which the data are representative of all injured children. CHIRPP data only reflect injuries treated in children's hospital emergency departments and those at six other hospitals. These may differ from those treated in general hospitals, as well as those treated in other settings such as private offices or community clinics. The CHIRPP data certainly differ from those pertaining to injuries that were never seen or treated by a physician.

Despite the important advantage that survey data provide with respect to their representativeness and the opportunity to relate injuries to other data obtained in the same survey, it is apparent that each of the surveys covered by this report has major limitations. As will be argued later, it should be evident that much can be learned from a national, purpose-built survey of childhood injuries.

Despite this need, the surveys described in this report cannot be dismissed. They provide valuable information that should be used immediately to influence future preventive activities.

To summarize, Table 39 gives the main findings from each of the surveys used in this report.

Table 39 – Summary of survey characteristics, injury estimates, selected surveys, Canada, 1990, 1993 and 1994/95

	HPS*	GSS**	NPHS	NLSCY
Year	**1990**	**1993**	**1994/95**	**1994/95**
Age group	15 to 19	0 to 14	12 to 19	0 to 11
Size of sample	1,010	2,946	1,847	22,831
Population	1,814	5,773	3,372	4,673
Total injured	N/A	559	971	468
Injury rate (%)	N/A	10	28.8	10.2
Main site	N/A	Home	Recreation day care	Home, school
Main injury	N/A	Cut, scrape	sprain, strain	Cut, scrape
Main type	N/A	Fall	Fall	Fall

(Note: All are household surveys)

* HPS did not ask about injury in the past year; injury questions did not provide estimates of prevalence but only to preventive behaviour.

** GSS included an estimated 5.7 million children under 15 of whom 559,000 were seen by a doctor for poisoning or injury.

The first message is that no matter which survey data are used, at least 10% of Canadian children are injured each year and that this represents, in raw numbers, nearly 500,000 children. Second, the greatly increased rate of injury among adolescents is striking and important because this age group often falls between the gaps; too old for pediatricians and too young for internists or family doctors. Third, although many injuries are not severe (cuts, scrapes, sprains and strains), most require medical care and thus expense, and a significant proportion are much more serious. Third, the main type or mechanism of injury is a fall. More attention needs to be given to how these injuries can be prevented, along the lines of the recently conducted playground studies in Quebec. (Lesage et al. 1995). Finally, the home and recreational sites being the main place of occurrence, preventive strategies need to be focussed on methods by which both can be effectively made safer, with preference, perhaps, to new regulatory mechanisms.

We also know a great deal from a wide variety of other studies. Many of these are population-based surveys, while others are ad hoc studies. An attempt to summarize their principal features and main results is shown in Tables 1 and 2 in the Appendix. It should be noted, once again, that this is neither exhaustive nor as up-to-date as we would like. Nonetheless, it provides a good opportunity to learn from the findings of others.

In general, a number of basic messages are shown repeatedly. They include the magnitude of the injury problem; the dominance of certain sub-groups defined by age, sex and other characteristics; the possibly important role of behaviour and temperament; the dangers associated with certain environmental situations (day care, work conditions, etc.). These are but a few examples of what has been learned from the work of others. The survey data are generally less focussed on specific questions, but have the great advantage of being, by definition, population-based. In contrast, the ad hoc studies are rarely population-based but provide, because of the purpose-built designs, results of great value. The most sensible way to approach these diverse sources of information about childhood injuries is to view them as complementary.

What more do we need to know?

Much more needs to be learned about childhood injuries (or injuries in any age group, for that matter) in order to plan and implement the most effective prevention programs. By far the most important set of data that are needed are those that help estimate exposure to risk for each of the major causes of injury. Only with such information can the role of other risk factors be clearly determined. For example, the pervasive sex difference is most likely to represent differences in exposure to risk between boys and girls. But if this is not so – if, for example, boys are no more likely to ride bicycles than girls and nevertheless experience more injuries – this is a vitally important piece of information.

The example above reveals the challenge in measuring exposure to risk. In the first place, although the difference is a subtle one, it is nevertheless important to acknowledge that the extent to which an activity is engaged in is not necessarily the same as the extent to which the child is exposed to risk. For example, while street crossings may be the best possible easily obtained measure of risk for pedestrian injury, it has been persuasively argued that actual risk in this situation is present only when the child or driver must take certain actions to avoid injury. Despite this important distinction, data on hours (or days) of activity are an essential first step toward measuring exposure.

The difficulty arises in having a metric similar to streets crossed for other risky situations such as exposure to hot water, flames or drowning. Nonetheless, should a major survey of child injury be launched, much attention must be given to this too-often neglected, but extremely important component.

Another often missing item of information is the extent of supervision provided. This, too, is far from easy to remedy but if we are ever to resolve the debate about how much can reasonably be expected from enhanced supervision, we must do our best to obtain such information.

Certainly, some means of obtaining a better understanding of the dangers in the child's environment, both within the home and in the neighbourhood, must be found and incorporated into future surveys. The ecological fallacy is well known and emerges often in national surveys. This is the assumption that characteristics of, say, the census tract in which the child lives apply to the individual family. To remedy errors arising from this fallacy, more direct information about the environment must be obtained.

To accomplish all of this, or even a large part of it, serious consideration must be given to the creation of a national survey focussed exclusively on child injury. The precedent clearly exists for such a survey, and the problem of injury is of much greater magnitude than that of drugs, for example, to which much attention has been paid in recent years.

What needs to be done?

As deficient as the survey data we now have may be, and as important as more and better surveys may be, what needs to be done to diminish the number and severity of childhood injuries is to make more effective use of existing information. Inaction at the program or policy level cannot be excused by the argument that the data are insufficient. Certainly, any argument that Canada must first replicate studies or surveys from other countries before it take action, is unacceptable. On the other hand, it is equally unacceptable to assume that as long as a neighbouring country such as the United States continues to obtain child injury data, there is no need for Canada to do so.

Ideally, national surveys should be both complementary – adding to what others provide – and confirmatory – replicating what others have found. Striking the balance between the two will not be easy. But the fact remains that sufficient information is now available from surveys and other observational and occasionally experimental designs to provide a solid basis for action.

The decision to take that action is a matter of political will in most instances, whether the level at which programs are needed are national, provincial or local. That will should be heavily moved by the data from the surveys reported here that clearly show the extent of morbidity related to injury in childhood. The level of morbidity far exceeds that arising from many other childhood disorders to which far more attention has been paid in the past. That attention is expressed in terms of funds available for research, for prevention programs, and in terms of willingness to make tough decisions that may not always have popular support.

An example of the latter is bicycle helmet legislation. As a by-product of this initiative, Dr. Millar and I examined in greater detail the frequency of head injury, bicycle and helmet use, (Millar & Pless, 1997). In doing so, we also obtained data from each of the provinces about legislation. At the time of writing, only two provinces in Canada require child bicyclists to be helmeted. This is surprising, to say the least, in light of the abundant evidence from part of the United States and Australia, for example, showing the efficacy and effectiveness of helmets in reducing head injuries among child bicyclists.

In the end, much of what needs to be done will be an uphill struggle unless and until health departments accept responsibility for the implications of these findings. Until the health community gives major priority to this significant health issue, children will continue to be injured at these alarming rates.

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Appendix

Table 1 – Population-based Surveys: National or State/Provincial

Ref. No*	Author	Source	Site	N	Age	Key Results
5	Bijur, PE (1986)	British Birth Cohort	Britain	11,966	0-5 years	Aggression and over-activity independently associated with injuries
51	Landman, PF (1987)	Telephone survey to day care centers	Maryland	18,728 children	2-6 years	Yearly injury rate of 11.3%; no reduction in injury rates in licensed day care
96,97	Smith, GA (1995, 1996)	National Electronic Injury Surveillance System (US Consumer Product Safety Commission [PSC]	USA	75,200 shopping cart-related injuries	<15 years	Children <5 yrs at highest risk (20% greater); mostly head and neck injuries, important cause of morbidity for under 5 age group
78,81	Rivara, FP (1985, 1997)	US NCHS Mortality Multiple Cause of Death tapes (1991-1993), CPSC National Electronic Injury Surveillance System (1990-1993) (NEISS)	USA	<19 years		Child farm injury deaths down but ED injuries up, farm injuries are a major problem
49	Kopjar, B (1996)	Prospective, ongoing injury registration system	Norway	Approxi-mately 100,000		Incidence of unintentional home injury highest among preschoolers (51 per 1,000) not accounted for by awake time at home

*See Primary Reference List

Table 1 – Population-based Surveys: National or State/Provincial *(cont'd)*

Ref. No*	Author	Source	Site	N	Age	Key Results
105	Waller, AE (1993)	Health Statistical Services	New Zealand	634	0-14 years	Children more likely to die in house fires than any other thermal injury event; 2/3 of hospitalizations are due to hot water, rates for children are higher than overseas
47	Klauber, MR (1986)	Random digit-dialing telephone survey	San Diego	1,213	<14 years	Education is positively associated with poisoning, and income is negatively associated with burns; children of caretakers working outside the home do not have higher rates than others, few differences in caretaker attitudes – may reflect having had an injury, rather than factors preceding it.
6	Bijur, PE (1995)	Child Health Supplement, NHIS (1988)	USA	11,840	5-17 years	Sports account for 36% of total injuries
59	MacKeller, A (1995)	Australian Bureau of Statistics	Western Australia	462	0-14 years	Mortality rates highest for motor vehicle accidents (5.1); drowning (2.9) mortality of Aboriginal children nearly 4 times greater than non-Aboriginals
63,64	Mercier, C (1995, 1996)	Admissions to hospital burn units and pediatric surgery units	France	687	0-5	Boys (59.3%) <36 months burned in kitchen (62.4%) with hot fluids (73%) or bathroom (16.2%) by tap water. Flame burns (8.7%) from flammable products
98	Sosin, DM (1996)	National Health Interview Survey	USA	603 injuries	0-14	Most frequent cause was a fall, followed by an MVA and adverse effects of drugs and biologics

*See Primary Reference List

Table 1 – Population-based Surveys: National or State/Provincial *(cont'd)*

Ref. No*	Author	Source	Site	N	Age	Key Results
11	Brown, EM (1994)	Ontario Health Survey (1990)	Ontario	60,972		20% had one or more visits to emergency department in past 12 months; subgroups with increased emergency department use after adjustment
12	Bussing, R (1996)	National Health Interview Survey (1988)	USA	11,630	0-14	Rates higher in white than African-American or Hispanic children, behavioural problems risk for unintentional injuries among three ethnic groups; prevention strategies should target behavioural disorders
24	DuRant, RH (1997)	Massachusetts Youth Risk Behavior Survey	Massachu-setts	3,054	High school students	Weapon carrying at school more strongly associated with violence and use of substances. A subgroup of students have been victimized at school
27	Fraser, JJ Jr (1996)	Child Health Supplement of the National Health Interview Survey (1988)	USA	7,470	10-17 years	Most frequent in older adolescents, males, whites and in Midwest. Most were cuts, sprains, strains and broken bones, head injuries. Injury is an important factor in morbidity
31	Harel, Y (1994)	Child Health Supplement of the National Health Interview Survey (1998)	USA	17,110	0-17 years	Varying recall periods affect epidemiology. Recall 1 and 3 mos recommended
48	Kogan, MD (1995)	Longitudinal Follow-up (1991) to the National Maternal and Infant Health Survey	USA	8,145	0-3 years	Preschool-age present different pattern of fatal vs injuries

*See Primary Reference List

Table 1 – Population-based Surveys: National or State/Provincial *(cont'd)*

Ref. No*	Author	Source	Site	N	Age	Key Results
57	Li, G (1996)	Nationwide Personal Transportation Survey, National Center for Health Statistics	USA	2,333	0-14 years	Males higher death rate from bicycling than females, a greater exposure and case fatality
4	Bijur, P (1988)	British Birth Cohort	Britain	10,394	5-10 years	Boys' behaviour at 5 strongly predictive of injuries subsequent 5 years than girls' behaviour; The odds of injuries resulting in hospitalization in boys with high aggression scores 2.4 times that of boys with low scores
52	Larson, CP (1988)	Telephone interviews re injury histories	Montreal	918 children	0-3 years	Three maternal factors (single, unemployed, smoking), and absence of younger sibling increase risk from 20% to 60%
82	Roberts, IG (1994)	New Zealand Household Travel Survey	New Zealand			Road crossings greater for girls; pedestrian exposure increases with age; 5-9 yr-olds, lowest income bracket, cross 50% more roads; sex difference injury rates not explained by differences in exposure
56	Li, G (1995)	National Pediatric Trauma Registry	USA	2,333 patients	0-14 years	54% of bicycle accidents head injury; mental disorders, no helmet; increased risk; high-risk groups
43	Jolly, DL (1993)	National Injury Surveillance Unit data	Melbourne, Brisbane			Low-income area significant. Predictor

*See Primary Reference List

Table 1 – Population-based Surveys: National or State/Provincial *(cont'd)*

Ref. No*	Author	Source	Site	N	Age	Key Results
108	Williams, BC (1990)	National Center for Health Statistics, WHO	USA, Canada, England, Wales, France, Nether-lands, Norway			Mortality increasing only in USA (MVA & homicide); excess mortality < 5 yrs and > 14 yrs; behavioural strategies inadequate
94	Sellar, C (1991)	Hospital inpatient records	Oxford Regional Health Authority	19,427 children	<5 years at time of first admission	Number more than one accident greater than expected if accidents random; at one yr follow-up, 4-5 yr-olds were least likely and < 1 yr-olds most likely to have further admissions
91	Schappert, SM (1997)	National Hospital Ambulatory Medical Care Survey (1992)	USA	36,271 patient visits		357 visits per 1,000 persons 1/3 visits injury related (falls)
103	Swigonski, NL (1995)	National Maternal and Infant Health Survey (1988)	USA	10,868 mothers		Adequacy of prenatal care not predictive of injury
92	Scheidt, PC (1995)	Child Health Supplement, NHIS (1988)	USA	17,110 children 2,772 injuries	0-17 years	Injury rate: 27 per 100 children (adjusted to 1 mo. recall); adolescents highest; 25% had medically attended injury each yr

*See Primary Reference List

Table 1 – Population-based Surveys: National or State/Provincial

Ref. No*	Author	Source	Site	N	Age	Key Results
61	Malek, M (1991)	1) Massachusetts Statewide Childhood Injury Prevention Project and 2) Health Data Institute	Massachu-setts	1) 87,000 children	0-19 years	Mean hospital. Cost $5,094, ED care $171; cost increases with age
58	Lowry, R (1996)	Youth Risk Behaviour Survey supplement to NHIS (1992)	USA	6,321	12-17 years	63% of adolescents reported 2-5 risk behaviours
2	Baker, SP (1994)	Consumer Product Safety Commission, hospital surveillance		58,480 head injuries	< 25 years	Large number and high rate of head injuries, multipurpose helmets valuable
69	Nowjack-Raymer, RE (1996)	Child Health Supplement, NHIS (1991)	USA			Football only sport where majority used mouthguards and headgear; differences in use not consistent across sports; multifaceted initiatives needed
7	Bijur, PE (1996)	British Birth Cohort	Britain	1915 case-control pairs	0-17 years	Cognitive deficits associated with multiple mild head injury due to social and personal factors
93	Schober, SE (1988)	Workers' compensation claims to Supplementary Data System of Bureau of Labor Statistics	24 states	23,823 claims	< 18 years	Injury rates 16-17 yrs: 12.6 males, 6.6 females per 100 full-time employees; not adequate protection

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Table 2 – Non-Population Based Surveys: Local, Ad-Hoc

Ref. No*	Author	Source	Site	N	Age	Key Results
46	Kendrick, D (1993)	Hospital admissions	Notting-ham Health District	342 pairs	< 5 yrs	Injuries at A&E dept predict admissions
44	Jordan, EA (1993)	Home interviews	Baltimore MD	363 children (68 exp inj)	3 months, 15 months	Children of mothers with home safety information by 3 mos had lower risk of injury
97	Smith, GA (1996)	Emergency dept. records	62 children	4 months – 10 years		Falling out of cart (58%), cart tip-overs (26%); cart tip-overs most frequent in < 1 yr
68	Mott, A (1994)	A&E dept. records	Cardiff	178 children		Mean 7.5 yrs; 105 fell from equipment; 125 surface injuries; high fracture rate on modern park playgrounds
30	Hahn, YS (1988)	Hospital admission for head injuries	Chicago	738 head injuries	0-16 years	43.1% of patients were < 3 yrs; mostly falls
28	Gofin, R (1993)	Primary care clinics – forms filled out by physicians	0-15 years			Differences between lower and middle class neighbourhoods in rate of injury; place of treatment; referral to hospital
62	McLoughlin, E (1990)		USA	1,461 deaths	0-19 years	"Cost of burn injury" approx. $3.5 billion; 47% killed in house fires 0-4 yrs; need solutions to "kitchen" scald and gasoline burns
89	Sarhadi, NS (1995)	Hospital inpatient records	Scotland	51,530 inpatients		Burn rates highest in < 15 yr-olds (43.7%); pattern of admission changed; fall in admissions in ages

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Table 2 – Non-Population Based Surveys: Local, Ad-Hoc

Ref. No*	Author	Source	Site	N	Age	Key Results
37	Hu, X (1993)	Emergency room injury surveillance program	Metro Toronto	1,538 patients	0.18 years	Falls most common (51%); hazards in child's psychological and motor development
67	Morrow, SE (1996)	Hospital records of burn victims		449 patients	< 16 years	Burn type, size and mortality rate did not differ between urban and rural children; Mortality: burn size, < 4 yr, inhalation
34	Heaton, PA (1996)	A&E dept. records	New Zealand	372 patients	< 15 years	58% male, 66% preschoolers; burns significant statistical difference. Morbidity; tap water scalds severe and preventable
40	Hu, X (1997)	Hospital discharge records and coroner's records	Metro Toronto	11,024 non-fatal injuries, 133 fatal injuries		Falls leading cause of non-fatal injury; international leading cause fatal; non-fatal and fatal rates dropped over 6 yrs; MVA and drownings increased
80	Rivara, FP (1993)	Hospital discharges	Washing-ton		< 19 years	Falls nearly 33% admissions, patients younger; 25% of fatal & 42% of preschoolers sustained head injury; annual
74	Pegg, SP (1978)	Hospital records	Brisbane	382 burns		Burns disproportionate. Common in children; 70% normal active children < 4 yrs
17	Christoffel, KK (1993)	USA				Leading causes of injury deaths for US adolescents are MVA and homicide
71	Parker, DL (1994)	Cross-sectional survey	Minnesota	3,051	10th-12th graders	Females: rural 12, urban 13 per 100,000 hrs worked. Males: rural 20, urban 16 per 100,000 hrs worked; ongoing medical problems; 26% injured workers; previous estimates of adolescent work-related injury may be low

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Table 2 – Non-Population Based Surveys: Local, Ad-Hoc

Ref. No*	Author	Source	Site	N	Age	Key Results
90	Sceats, J (1989)	A&E dept. records	Waikato – New Zealand Australia	50,000	< 15 years	Attendance rates for injury highest for infants, then 10-14 yrs; very high rate attendance Maori infants; falls for < 10 yrs, sports 10-14 yrs
106	Watkins, J (1996)	Retrospective study injuries treated at sports injuries clinic	London	394 injuries	5-17 years	45.2% females, peak females 13-14 yrs, males 15-16 y rs; 50% acute, 49.5% chronic
1	Backx, FJ (1989)	Questionnaires to students, large scale, population-based survey	Holland	7,468 students 791 injuries	8-17 years	Injury rate: organized sports (62%), phys ed classes (21%), unsupervised (17%); highest rates basketball, field hockey; high risk group: 15-16 yr-old boys, high sports activity index, played mainly contact team sports
8	Boyce, WT (1989)	Recurrent injuries in school district population, prospective surveillance system	California	54,874 students, 573 re-current injuries	6-18 years	Small group sustain disproportionate % of injury; majority experience transient periods of enhanced risk
88	Santer, LJ (1991)	Interviews with care givers, medically indigent urban children	Chicago	133	< 6 years	Need for prevention focussed on low-income urban families
54	Leland, NL (1994)	Record review of injury logs in day care programs				Children with disabilities higher rates
95	Simon, PA (1994)	Hospital discharge data and burn unit admission logs	Denver	122	< 5 years	Developmental stage important deter-minant of risk and type of burn; 6 mos – 2 yrs at increased risk of severe burn

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Table 2 – Non-Population Based Surveys: Local, Ad-Hoc

Ref. No*	Author	Source	Site	N	Age	Key Results
10	Briss, PA (1994)	Interviews with directors of day care centres	USA	138,404		Most injuries (51%) on the playground; day care centre rates relatively low and many minor
41	Jaquess, DL (1994)	Parent questionnaires and reports		50		Children with behaviour problems may be predisposed to injuries; behaviour change strategies to reduce injury risk and target children for prevention
16	Chang, A (1989)	Injury incidents in day care centres (Los Angeles Unified School District)	Los Angeles	423	< 5 years	Relative risk boys and girls was 1.5:1; younger boys highest rate and older girls lowest; the majority minor; medical attention in only 12.8%; 75% preventable
20	Davidson, LL (1988)	Hospital records	UK	951	5-8 years	Increased risk for boys and discipline problems; predicted relationships between overactive behaviour; decreased concentration and rate not found
50	Kotch, JB (1993)	Hospital records	New Zealand		< 5 years	528 hospitalized injuries involving playground equipment, 145 day care injuries; home and day care injuries of equipment differences
75	Peterson, L (1993)	Interviews with mothers and children	USA			Children report more injuries than mothers; children recalled far fewer and mothers recalled slightly; fewer events than reported in biweekly interviews; fewer near injury than actual injury events reported
14	Carter, YH (1993)	General practice who presented at hospital	North Stafford-shire	511 children	< 5 years	Most fall (56%) at home (79%); younger mothers more likely to have sibling injured the previous year; doubt value of safety equipment and knowledge alone in prevention

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Ref. No*	Author	Source	Site	N	Age	Key Results
76	Price, JH (1997)	Pediatric residence programs	USA	209		Fewer than half believed firearm issues should have high priority in residence programs
83	Ruch-Ross, HS (1993)	Questionnaires to pediatricians	USA	1,201		80% of pediatricians who provide health supervision discuss helmet use; most important predictor of helmet counselling was experience with injured children
23	Dunne, RG (1992)	Street-crossing and vocabulary tests administered to parents			5-10 years	Parents' expectations for their children's pedestrian skills are least accurate for 5 and 6 yr-olds; mismatch decreases with age; inaccurate expectations may be target for prevention
25	Evans, SA (1997)	Postal survey	Lanark-shire Health Board area		3 years	Differences injury experience of children from more and less affluent backgrounds not due to differences in parental attitude, knowledge, or practice of home safety
39	Hu, X (1996)	Telephone survey	Metro Toronto and Barrie	1,516		Parents aware of childhood injury; need to be educated about specific risks
63,64	Mercier, C (1995, 1996)	Hospital admissions to burn units and pediatric surgery units	France	937		Typical burn patient boy (61.6%), 2 yrs, scald burn (64.1%) in kitchen (56.2%)
26	Finvers, KA (1996)	CHIRPP		699	3-16 years	Risk of head injury significantly greater when helmet not worn
107	Weiss, BD (1986)	Observation of students arriving at schools		468		University bicyclists wear helmets more often than younger bicyclists

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Table 2 – Non-Population Based Surveys: Local, Ad-Hoc

Ref. No*	Author	Source	Site	N	Age	Key Results
42	Johnston, C (1994)	Police-reported car crashes	USA		0-14 years	Greater involvement in care crashes and less use of restraints explains the 64% higher rate of injury for 3 yr-olds than for infants
22	Dickson, DG (1997)	Regular visits of data collectors to physicians, dentists, and hospitals			< 7 yrs	Annual rate of 124 per 1,000 children under 7 yrs; two or more injuries 10%; highest rate 2 yr-olds; 2 yr-old boys 75% higher than other age/sex group
78	Rivara, FP (1985)	Census tracts Injury statistics	Memphis	210 injuries	0-14 years	Injured child most often: male, age 7. 3 yrs; crossing between intersections, 2-7 PM; census tracts with injuries twice the % of nonwhite population, lower incomes, more children in female-headed households, below poverty level, greater crowding
70	Overpeck, MD (1995)					For children without medical coverage, 30% of all injuries and 40% of serious injuries may not be attended by MD
73	Paulson, JA (1988)		USA		Adoles-cent	Leading cause of death; road most dangerous environment; alcohol/drugs contrib. factors; schools – nonfatal sports injuries; home – adolescent, injuries less common; Farm – understudies
3	Banco, L (1994)	Chart review of first visits of burn patients	Hartford Connecti-cut	109 visits	< 18 years	Contact burns, scalds, flames/explosion, cigarettes, electrical; contact burns higher for < 11 yrs
86	Samuels, RH (1996)	Survey of orthodontic practitioners	UK and Eire			Injuries due to orthodontic face-blows

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Table 2 – Non-Population Based Surveys: Local, Ad-Hoc

Ref. No*	Author	Source	Site	N	Age	Key Results
87	Samuels, RH (1996)	Questionnaires to dental practitioners	UK and Eire	1117 respond-ents, 859 users		33 injuries with orthodontic face-blows
38	Hu, X (1995)	Random digit dialing telephone survey and analysis of hospital discharge records	Metro Toronto		5-17 years	Boys higher rates (8.1 vs. 3.4 per 100,000); bicycle-related injuries associated more with exposure than distance ridden
109	Williams, JM (1997)	Self-complete questionnaire school survey	Scotland	4,710	11, 13, 15 years	Socio-economic status affects injury events and risk behaviour
77	Ray, JG (1995)	Retrospective chart review of inpatient burn cases	Hamilton, Ontario	50 patients	< 5 years	2/3 consumption or prep of food or hot liquids, 1/3 flame burns or bath tub scalds; significant difference in surface area and days spent in the BTU to agent involved; infants and toddlers disproportionate burn victims
19	Currie, CE (1996)	Self-completed questionnaire in schools	Scotland	4,710	11, 13, 15 years	41.9% reported medically attended injury; 1/3 moderate or severe; incidence and distribution consistent with estimates based on other data sources
9	Brison, RJ (1988)	Collision fatalities records (State death certificates, coroners' reports, police records)	Washing-ton		< 5 years	Factors in collision age dependent; pedestrian fatality < 5 yrs occur when child backed over in the driveway
84	Ruta, D (1993)	A&E dept. records	Aberdeen, Scotland	91 cases		24.4% all nonfatal injuries sustained by passenger prevented if all children restrained; 49.5% of head injuries and 48.4% of face injuries preventable

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Ref. No*	Author	Source	Site	N	Age	Key Results
36	Holloway, M (1994)	Hospital records	Ranwick, New South Wales, Australia	49 children	1 mo. – 8 years	Retinal hemorrhage and unconsciousness on admission were with poor outcome; cerebral edema associated with severe motor disability; lowest SES was risk factor
21	Davis, JM (1993)	Trauma registry and retrospective chart review	Boston	142 patients		Serious sports injuries in ED mostly male teenagers, fractures of extremities
35	Hijar-Medina, MC (1995)	Hospital records	Mexico City	350 case-control pairs		Protective effect on severity when mother worked outside home; no differences in sex and age; mother < 24 yrs and low schooling significant risk of major injuries
29	Gunn, WJ (1991)	National telephone survey	USA	171 poison-ings		No poisonings during out-of-home child care; out-of-home child care no increased risk of injury (maybe lower risk)
55	Lesage,D. (1995)	Playground survey 254 playgrounds	Montreal			One of two pieces of playground equipment was installed on protective surfaces that did not conform to Canadian standards
53	Layne, LA (1994)	Emergency dept. records	National sample of emergency depts.	37,405 occupa-tional injuries	14-17 years	Injury rate: 7.0 males, 4.4 females per 100 (full-time employees); lacerations to hand or finger; majority in retail trade (e.g. restaurants)
85	Sacks, JJ (1989)	Injury reports from day care centres	Atlanta	5,300 (143 injuries)		1.77 injuries per 100,000 child hours in day care; lowest rate in infants, highest rate in 2 yr-olds 33% of falls on playground

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Ref. No*	Author	Source	Site	N	Age	Key Results
18	Cooper, SP (1989)	Cause-of-death information	Texas		0-19 years	34% of deaths; 46% involve MV, 22% intentional
110	Winn, DG (1991)				< 5 years	Differences in pedestrian injury events between toddlers (0-2 yrs) and preschoolers (3-4 yrs); toddlers more non-traffic events: (vehicles backing up); preschoolers more traffic sites: crossing/ darting/mid-block

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